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Learning the Lesson

The Kingston and Fylde Breakdowns

THERE is a good deal of truth in the saying that progress in electricity supply owes much to what can be learned from its failures in particular instances. Unfortunately, however, the experience so gained has in the past been limited very largely to those most directly concerned. Two reports issued this week by the Electricity Commission—on the serious breakdowns at Kingston and Fylde—are therefore to be welcomed for the information they make available as to what really happened and the lead they give to the action required to make similar occurrences less likely in the future.

Technically there is little similarity between the two cases. At Kingston, the accident did not originate in any defect in plant or cables but was turned from what might have been a minor mishap (such as must always be allowed for) into a major disaster due to insufficient physical segregation between items of plant. The result was a bottleneck in which two distinct sources of supply, each with its own adequate stand-by, were put out of action simultaneously for many hours.

Floating Neutral

At Blackpool and its neighbouring towns, the trouble originated in a fault in an obsolete belted 33-kV cable section in a mixed overhead and underground feeder and the failure of an old type of protective relay. There was here no suggestion of the ineffectiveness of a duplicate supply on account of a bottleneck—although the increasing demand in the area and the derating necessary for the belted cables left little enough margin—but the damage done gives a first-class example of what closing a switch on an arcing ground can do.

But for the mistake in not earthing the 33-kV neutral solidly, when the earthing transformer tripped out for a not easily explainable reason, there seems no reason to suppose that the whole of the supply could not have been maintained through the initially sound feeders with the aid of the generating plant at Blackpool. It may be observed, however, that it was intended that the earthing transformer should trip out if the maximum fault current were sustained for more than 30 seconds. Moreover, some time might elapse before its opening was discovered and solid earthing could be effected by manually closing the power-transformer neutral switches. This appears to be an instance in which an arc-suppression coil would have proved its worth.

Although, then, there were considerable differences in the engineering features of the two breakdowns, common inferences can be drawn from them. Mr. Henry Nimmo, the Chief Engineering Inspector of the Electricity Commission, makes two of outstanding importance. The first is the need for closer co-operation between officials in details, since misunderstandings between men of the same undertaking were leading contributory factors. This lack of co-operation between individuals contrasts strongly with the ability to work together displayed between different undertakings, which played so large a part in facilitating the restoration of supplies—and long as the failures may appear to have lasted, a realisation of what was involved in the work thus carried out in the most trying circumstances shows the effectiveness of this co-operation no less than the staffs' ability to deal with emergencies.

Switchgear Segregation

The second point of common significance made by the Inspector is the need to carry out to the fullest practicable extent the recommendations made by the Fire Risks Investigation Committee in March, 1938. The first of these is to the effect that in major installations each section of switchgear should be housed in a separate building. If the 11-kV switchgear at Kingston had been regulated in this way, the interruption of supply to the Corporation's consumers would probably not have lasted an hour.

Again, if the control gear circuits had been protected with fire-resisting materials the effect of the bus-bar fault in the station would probably not have been so formidable. Another of the Committee's findings relates to the need for fixed as well as portable equipment for fire fighting. While the portable extinguishers proved fully equal to coping with the small fire in the Blackpool switchroom in its initial stages, they could not be used at all at Kingston where the fire developed rapidly.

Apart from these conclusions, there is another to which the Inspector gives prominence. If the erector in charge of the reconstruction of the switchgear at Kingston had not flashed the spout contact to earth (which started the trouble), it seems probable that he or one of his men would have received a severe shock.

The practice is a common one in order to get rid of possible static charges on high-voltage conductors but it is an exceedingly dangerous one unless it is known definitely by a prior test with an appropriate instrument that the conductor is dead.

There are—it will be seen—a large number of "ifs" about the matter. By following the lines of thought they prompt, some fruitful ideas should present themselves for improving the reliability of electricity supply.

Towards Standard Voltage

DURING the five years that have elapsed since Mr. L. Romero urged in his I.M.E.A. paper the adoption of the standard voltage for all new sub-station low-voltage networks, the cost incurred and difficulties involved in the (ultimately inevitable) change over to 230 V have increased with the number of consumers. The Electricity Commissioners now have the matter in hand in regard to the hundred or so of undertakings that supply AC at less than the standard. They might, indeed, have gone further and included in their enquiry the sixty-three undertakings supplying AC at 240 V, for Mr. Romero's own experience at Salford is that although this group would not gain the same advantage in an increase in effective mains capacity, the cost to them of standardisation would be very little. The position of the forty-nine distribution authorities declaring 250 V is different and might involve considerable expenditure. If outside financial assistance is to be given for voltage standardisation, which would presumably be raised from the industry itself, we think with the author that those who have done this on their own initiative should be exempted from contributing.

Trolley-buses for Cardiff

A NOTABLE victory for the trolley-bus has been gained at Cardiff. On Monday the City Council decided that the tramways which it had already decided to scrap should be replaced by a trolley-bus system in preference to petrol buses. Alderman A. E. Gough, in moving a resolution to this effect, maintained that trolley-buses would be cheaper, and that there was a public demand for them. Moreover, by adopting them they would be giving employment to Welsh miners instead of using imported fuel. The decision was taken in the face of a recommendation by the Transport Committee that the manager of the Newcastle-on-Tyne transport undertaking should be called in to advise. Cardiff's wisdom is confirmed by the report that Rotherham has decided to purchase trolley poles and wire to enable certain routes to be converted from petrol-bus to trolley-bus operation in the event of a national emergency, when supplies of imported oil might be difficult to obtain. Cardiff with avoid this unnecessary duplication of systems.

Haggling at Halifax

THE rather meagre results obtained when it offered £1,100 per annum for the post of electrical engineer should have convinced the Halifax Town Council that there was something wrong. Apparently the experience taught it nothing, for last week it decided to persist in its course by deferring consideration of the matter for six months when, presumably, it will try again. Some councillors appear to have but a hazy idea of the functions of a chief electrical engineer. One member scouted the idea that a "super genius" was wanted to run the new plant because the manufacturers had guaranteed its running for twelve months. But there is a considerable difference between a turbo-alternator set and a domestic refrigerator—and the running of the plant is not the engineer's only or even principal, job nowadays. We hope that the Light, Heat and Power Committee will persuade the Council into a wiser course than that to which it stands committed.

Reliability of Supply

WHILE complete security of supply may be an unattainable ideal, one could get fairly close to it by paying the price. As in the case of power factor, however, the nearer one approaches unity, the more costly each decimal place of improvement becomes until further advance is economically impracticable. Even the continued piling up of spares would not do, since the attainment of reasonable reliability is often rather a question of balancing risks, as Mr. Bolton points out in his article (p. 675). Thus, while taking a bulk supply may remove the risk of prolonged interruption due to breakdown of generating plant, the total number of minor interruptions might be increased due to irregularities on the transmission system; bus-zone protection would reduce the risk of destruction of control centres, but possibly at the expense of unwanted tripping of breakers; when apparatus is taken out of commission for maintenance in order to reduce the likelihood of its failure in service, there is always the chance that the temporary reduction in the customary spare margin may be made at a time that a fault appears on the system. Again, there are the chances to be taken in making full-scale trials of devices that have given promising results in an experimental stage and which, if successful under practical conditions, would improve reliability in the long run. These are but a few examples of the many conflicting risks to be taken into account, and a correct choice between them must depend upon judgment based on experience.

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Distribution Again

IN spite of the many urgent matters now engaging the Government's energies the long-delayed Distribution Bill has not been forgotten. Indeed, the new Minister of Transport (Capt. Euan Wallace) stated last week that it was regarded as "a matter of major importance with which it was intended to deal as soon as circumstances permitted." The statement was made in an answer to questions by Mr. de la Bere, who said that rural areas were at present inadequately supplied and that the lack of uniformity in supply and charges was "an absolute scandal." We doubt whether any Distribution Bill will bring about an electrical millennium as some people seem to think, but it is as well to know that it has not been forgotten.

Another Institution's Policy

OUR article on "The Institution's Policy" (*Electrical Review*, April 28th) has come under the notice of "Janus" of the *Gas Times*. After quoting a passage in which it is suggested that in the interests of a large section of the members more attention should be given by the I.E.E. to administration and management matters, "Janus" says that he cannot imagine what the writer would think of the Institution of Gas Engineers. In comparison the I.E.E. "might be mistaken for a commercial organisation." It is perhaps comforting to know that our rivals are in no better case than ourselves but that should not engender complacency and prevent self-improvement.

E.A.W. AT CARDIFF

Record Attendance at Annual Conference

FOR the first time in the fourteen years' history of the Electrical Association for Women applications to attend its annual conference held last week at Cardiff had to be refused, about a hundred members having to be disappointed. There was an average attendance of over 500 from the Association's eighty-five branches at each of the sessions and there were about 600 at the luncheon held on Thursday.

A happy send-off to the proceedings was given on Wednesday evening, when delegates, after registration, were entertained at a reception given by the Cardiff and District Branch at the Park Hotel. Mrs. A. C. MacWhirter, chairman of the Branch, welcomed the visitors to the city and Councillor Mrs. Gregory, chairman of the Association, responded. Music and recitations concluded the function.

The conference proper began the following morning with the opening session at the Reardon Smith Lecture Theatre. Welcoming the delegates, the Dowager Lady Swaythling, President of the Association, mentioned that this was the first time that the conference had been held in South Wales and said that its success was already assured by the large attendance.

[Elec. Rev. photo.
The President and the Director arrive for the opening session at the Reardon Smith Lecture Theatre

Addresses of greeting were also given by the Lord Mayor of Cardiff (Alderman W. G. Howell); Lady Herbert Lewis, president of the Cardiff Branch; Mr. J. F. Rees, principal of the University College of South Wales and Monmouthshire, who mentioned that it was hoped to provide at the new buildings for the Domestic Arts College a kitchen devoted entirely to electricity; and Dr. J. Greenwood Wilson, the Medical Officer of Health for Cardiff, who praised the work of the Association for helping women to have more time to take part in movements promoting health, to be fit for their jobs, and to raise maternal efficiency in the home, with a resulting lower child mortality and the production of healthier children.

This question of the relationship of electricity to physical fitness is a matter to which the Association is at present devoting a good deal of its attention and formed the subject of an address by the President. In a typically witty speech, Lady Swaythling declared that, while it was true that one man's meat was another man's poison, fresh food of a decent quality, grown, produced, sold and handled hygienically, and well cooked under clean conditions, made a tremendous difference to health. One of the first essentials of a happy home was cookery wisdom and a good cook was in a very superior position.

[Elec. Rev. photo.
Delegates arriving at the opening session

Those who had electric kitchens knew what an attractive place a kitchen could or should be. There were first-class women kitchen experts to help replace existing kitchens which lacked conveniences. More and more electrical appliances were coming within the reach of the average housewife.

[Elec. Rev. photo.
The Lord Mayor presenting his address of welcome

Speaking on the subject: "What is involved to produce the electrical amenities we enjoy," Dr. A. P. M. Fleming, President of the Institution of Electrical Engineers, declared that everyone sought some higher standard of living, and this could be achieved only by the use of power. In fact, the whole material progress of civilisation had been contemporary with the use of power, but that this was not so evident until the arrival of electricity, which had been responsible for many of the advantages and facilities we now enjoyed. Electric lighting, broadcasting, television, labour-saving devices, &c., had crowded one after another until they had become commonplace.

If the cost of producing these amenities was more widely known we should perhaps appreciate them better. Tracing the source of electricity back to the sun, Dr. Fleming outlined the various stages in the history of electrical knowledge and said that electrical apparatus could now be produced at prices within reach of all. No fewer than 430,000 persons were now engaged in the electrical industry and £100,000,000 was invested in electrical enterprises in this country alone. It was not, however, to the number of electrical engineers and workers but rather to their skill that our thanks were due.

The Value of Colour and Light

The fact that colour and light played an important part in promoting health and happiness was emphasised by Miss Sali Lobel, principal of the Everywoman's Health Movement, whose demonstration illustrating "the art of living through the medium of correct exercises" appeared to make a considerable impression on her audience.

A vote of thanks to the speakers was proposed by Mrs. M. B. Jackson, a member of the National Executive Committee.

Lady Swaythling again presided at the official lunch of the Association held at the City Hall. The toast of "The City of Cardiff" was proposed by Mrs. A. E. McColl, chairman of the Glasgow and District Branch, and the Lord Mayor responded. Giving the toast of "Electrical Progress," Sir Felix J. C. Pole, chairman of Associated Electrical Industries, Ltd., contrasted the average home of forty-five years ago with that of to-day.

In his early days, he said, probably the only electrical appliance to be found in the average house was an electric bell. Water was heated by very inefficient ranges and bathrooms were few and

far between. Carpets were brushed with hard brooms and much dust was deposited on the walls and furniture. Oil lamps and candles constituted the most common form of artificial light. Fires in bedrooms were regarded as a luxury and few houses had telephones.

To-day electric lighting and heating in great variety were common. Vacuum cleaners had taken the place of brooms and brushes. Water was heated and food prepared, cooked or preserved by electrical appliances. The labour of washing and ironing clothes had been removed by the use of electric washing machines, irons, &c. The latest device was a dish-washing machine and there were also gramophones, wireless sets, telephones, &c.

[*Elec. Rev. photos.*

Above: Delegates listening to the address given by Dr. A. P. M. Fleming. Right: On their way to the official lunch at the City Hall

Each addition to the household electrical equipment was the result of costly scientific research, but with every development the cost of electrical comforts had been reduced. Whereas in 1922-23 the average cost per kWh sold for lighting and domestic purposes was 5.30d., in 1937-38 it was only 1.693d. and he had no doubt that the downward tendency would continue. There were now over nine million consumers, an increase of over 350 per cent. during the past ten years, while electricity generated in 1938 was over three times the 1928 figure and no less than eleven times the 1914 figure. In fact, the average increase of the last two years was approximately equal to the 1914 output.

Efficiency in steam generating plant had been so remarkable that one unit of electricity could be generated to-day for about half the amount of coal. This increase in efficiency had counterbalanced the increase in the price of coal. Equally striking was the improvement in the efficiency of the electric lamp. He remembered the time when the standard lamp was 16 candle-power and was rated at 50 W. It usually took about 3½ W per candle-power. The modern gas-filled incandescent lamp required only ½ W per candle-power, and certain of the electric discharge lamps now being extensively introduced had a much higher efficiency.

As a result the general standard of lighting had been raised tremendously, the roads had been made safer at night, and factory workers had been given lighting that enabled them to work in ease and comfort. Fluorescent materials opened up another vista and he looked forward to an era when we should be able to light our homes, offices and public buildings with a light of a new efficiency and having any colours we might desire.

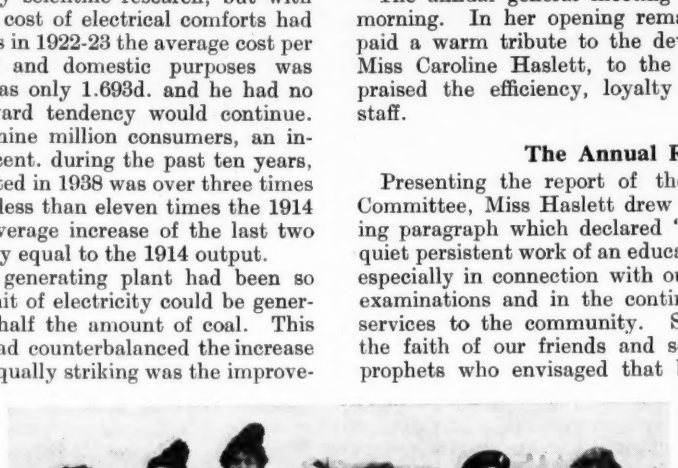
Professor Olive A. Wheeler, professor of education at the University College of South Wales and Monmouthshire, replied and said that by reducing drudgery and eliminating many repetitive actions formerly regarded as necessary, electrical progress had made it easier for a woman engaged in home-making to live an interesting and full life. Mr. E. Jones, Cardiff city electrical engineer and manager, proposed the health of the chairman, who in responding read a telegram of greeting sent to the King and His Majesty's reply.

After lunch visits were arranged to the Civic Buildings, the National Museum of Wales, Llandaff Cathedral and the Docks, followed by a civic reception at the Cardiff City Hall.

The annual general meeting was held on Friday morning. In her opening remarks Lady Swaythling paid a warm tribute to the devotion of the director, Miss Caroline Haslett, to the Association, and also praised the efficiency, loyalty and keenness of her staff.

The Annual Report

Presenting the report of the National Executive Committee, Miss Haslett drew attention to the opening paragraph which declared "that it is a record of quiet persistent work of an educational nature, revealed especially in connection with our electrical housecraft examinations and in the continued progress of other services to the community. Such a record justifies the faith of our friends and serves to confound the prophets who envisaged that before now we should experience stereotyped and monotonous programmes and a dearth of good speakers, apart from a few outstanding women." This, she said, was an apt comment on the function of the Association, and added that last September's crisis had shown that an educational association could use its machinery for national work in time of emergency and that even in a crisis good and progressive causes must always persist.



On the promenade at Porthcawl [*Elec. Rev. photo.*

Branches had evinced much interest in the Nutrition Campaign inaugurated at last year's conference, and in connection with the Home Workers' Campaign 169 certificates had been awarded last year, bringing the total to 366. The first award of the rosebowl to be pre-

sented by Councillor Miss Walter, chairman of the Worthing Branch, to the school with the highest average marks in the tests for the Home Workers' Campaign would be made this summer. An appeal was made for further contributions to the Bursary Fund.

Training Demonstrators and Teachers

The work of the Training and Diploma Committee continued and last year 121 certificates had been awarded to demonstrators and 122 to teachers, making totals of 638 and 540 respectively. Twenty-two diplomas had been awarded to demonstrators and twenty to teachers and the first practical test for teachers was made during the year. The Central England Training and Employment Committee had been actively engaged in facilitating the training of girls anxious to enter the electrical industry on the sales side. The Association was receiving an increasing number of requests for its scale of salaries for demonstrators.

A three days' refresher course for senior demonstrators was held in April and a similar course for teachers arranged last September was attended by nearly a hundred. Schools to affiliate to the Association during the year included the first elementary school, and the Association had been pleased to welcome increasing numbers of parties from schools, &c., to its headquarters. As a result of a speakers' course the Association had greatly enlarged its panel of lecturers.

Waiting for the official photograph. In the front row from left to right are Mrs. H. Bentham, Mrs. W. Scott, Councillor Mrs. Gregory, Sir Felix Pole, Lady Herbert Lewis and Lady Swaythling [*Elec. Rev. photo.*

Besides the annual conference, there was a special conference held in connection with the Glasgow Exhibition. Area conferences were held at Blackpool, Halifax, Newcastle and Rugby, and the E.A.W. was represented at many exhibitions. All accommodation for the E.A.W. day at the I.M.E.A. Convention at Harrogate had already gone. Further contacts had been made with other organisations and the director had been appointed to the Central Committee on Women's Training and Employment. Another appointment was that of the Chairman, Mrs. Gregory, to be Chairman of the West Ham Electricity Committee. Three flats for poorly paid elderly women had been subsidised by the Association.

New branches had been formed at Nottingham, Oxford, South-East London, Middlesbrough, Shipley and Winchester, and new units at Middleton and Wimbledon. The Radcliffe and Whitefield unit had been divided into two. Miss Haslett congratulated branches on the high standard of their meetings.

Councillor Mrs. Ross (Edinburgh), who proposed the adoption of the report, thought that the work of the Association was mainly educative, while Mrs. F. N. Rendell-Baker believed that the Nutrition Campaign had drawn more attention to the Association than any other of its activities: she would like to see public-speakers' courses inaugurated by all branches. The report was adopted unanimously.

Presenting the accounts, Mrs. W. Scott, hon. treasurer, pointed out that by reorganisation and economies it had been possible to wipe out last year's deficit and to have a credit balance of £47. She paid a tribute to the work of Miss Tyacke who had acted as accountant. The adoption of the accounts proposed and seconded by Mrs. Haslam (Cardiff) and Mrs. F. L. V. Mathias (Warrington) was unanimously approved.

Lady Swaythling and Mrs. Scott were re-elected president and hon. treasurer, while Mrs. Bentham and Mrs. Jackson were appointed chairman and vice-chairman respectively. The following were appointed to the National Executive Committee:—Mrs. T. Campbell, Councillor Mrs. Garrard, Mrs. M. B. Jackson, Mrs. F. V. L. Mathias, Mrs. F. N. Rendell-Baker, Mrs. V. Scott and Mrs. Watson Ingram. Nominations of area representatives for co-option to the National Committee were as follows:—Mrs. B. T. Hawkins (N.W. England and N.W. Area), Miss N. Balls (N.E. England), Mrs. C. H. Yeaman (Central England), Miss V. McLean (Mid-East England), Mrs. Tatchell (S.E. England), and Miss E. C. Morris (S.W. England and S. Wales).

To facilitate the formation of "kindred society groups," a motion, proposed by Councillor Miss Walter (Worthing) and seconded by Mrs. S. Ritson (Sunderland), was carried reducing the number of members required from twenty-five to twelve. A further resolution, proposed by Councillor Mrs. Armitage (Watford) and seconded by Mrs. Crabtree (Walsall), was passed, expressing thanks and best wishes to the Lord Mayor, the Lady Mayoress, the City Council, the Cardiff Electricity Department, the local branch of the E.A.W., the South Wales Institute of Engineers, and the various other associations, companies, &c., contributing to the success of the conference.

Future Annual Conferences

Miss Haslett announced that invitations had already been received to hold the 1941 conference at Harrogate and that in 1943 at Southport. In recognition of her four years' service as chairman, Councillor Mrs. Gregory was presented by the Executive Committee and members of the Council with a diamond-studded platinum watch. The President also presented the Countess of Westmorland antique coffee tray to Mrs. Rendell-Baker, representing the Croydon Branch, winners of the Nutrition Campaign contest.

Local electrical manufacturing interests were hosts at a luncheon which followed at the Park Hotel. Proposing the toast of "The City of Cardiff," Miss Haslett thanked not only the Lord Mayor and civic authorities for their hospitality, but also "the men behind the scenes." The Lord Mayor, replying, said that his secretary had told him that it was the most perfectly organised gathering he had ever known in the city. The toast of "Our Hosts" was proposed by Lady Swaythling, and the chairman, Mr. C. J. Neale, responded.

The afternoon was spent on a motor coach drive through the Vale of Glamorgan, along the Ogmore coast to Porthcawl, a visit to the Prince of Wales' Theatre to see "Good-bye, Mr. Chips," occupying the evening. On Saturday morning the South Wales Electric Power Co. arranged a trip to Caerphilly Castle and the Treforest Estate.

POWER FOR INDUSTRY

A Tour of the South Wales Company's Area

(*Concluded from last week, page 636*)

TO afford us an opportunity of obtaining some first-hand impressions of the area and the system Mr. L. Howles, general manager of the South Wales Power Co., kindly arranged some short tours.

We set off on the first day to see something of the central part of the area. Making our way out of the Cardiff district we first saw the Whitchurch sub-station where a supply is made available to the Cardiff R.D.C. This is an indoor station with outdoor transformers, and with its B.T.H. 11-kV Q.F. type switchboard it is a fair example of the sub-stations which supply authorised undertakings.

Travelling north-west we passed through Taffs Well where a cluster of works within, say, a quarter-mile radius are fed from the local distribution system. The cluster includes the Caerphilly U.D.C. public utility, dolomite, light engineering, forgemasters, tipping-waggon and shovel works, quarries, iron-ore and coal mines and a mining-equipment depot. At Nantgarw we passed the deepest colliery in Great Britain and immediately before the Upper Boat power station we travelled through the new Treforest Trading Estate.

In last week's article the general layout of the South Wales Power Company's system was described. This week we record some impressions gathered during our tour of the area.

The 11-kV bulk supply to this estate is metered at Upper Boat and is delivered at two sub-stations at the north and south ends of the estate, respectively. Two 0.25-sq. in. cables connect Upper Boat and the north sub-station and two cables interconnect the two sub-stations. About 60 factories are now established on the estate and the products include heavy switchgear (Whitehead), batteries (Celtic), refractories, concrete reinforcement, dry ice, paint and varnish, abrasives, leather belting, confectionery, aeroplane parts, and so on.

The visit to Upper Boat was intensely interesting for in addition to the new distribution centre to which we have already referred we saw under construction two new 30,000-kW turbo-alternators, a 2¼ million gallons per hour cooling tower and two pulverised-fuel fired automatically controlled boilers, the first of which is already on load with hand control. For control of station auxiliaries there is a switchboard of Brown Boveri 3.3-kV air-blast units and Mr. Pugh, station superintendent, spoke highly of its operation. A glimpse at the undertaking's building department depôt before we left Upper Boat gave us an idea of how an essentially maintenance organisation is kept virile by the addition of constructional work. All sub-stations are built by the department and all low voltage distribution lines and high-voltage lines up to five miles long are erected by the undertaking.

The 33-kV sub-station at Coedely Colliery

On the road to Pontypridd we had a most impressive view, looking down on the Upper Boat generating station, with the Trading Estate in the distance. A sight of the s.c.a. transmission line to Nantwen over the mountain top on the left inspired the comment that it had been found good practice to leave the conductors of lines in such exposed places stressed below the recommended figure. A little further on we saw the Rhondda U.D.C. destructor generating station which runs in parallel with the South Wales supply.

At Tonypandy we visited the Glamorgan Colliery which has "come on" during the past six months and is taking about 5,000 kW. Steam-driven air compressors were being converted to electric drive. The P.D.A.C., Ltd., owners of the Glamorgan Colliery, have about a score of collieries and works in the undertaking's area of supply and the overall annual consumption is about 63 million kWh. At Ystradyfodwg, travelling south to Bridgend, we saw an H-pole line running over the mountain to Cwm Parc Colliery.

In the Ogmore Valley at Nantymoel we called at the colliery of the Ocean Coal Co., which is just being electrified. Eight collieries owned by this company take about 20 million kWh per annum. The line immediately past this colliery illustrated the undertaking's policy of sheltering the lines in the valleys wherever possible. The arsenal under construction near Bridgend revealed intense activity. There is at present a temporary 200-kW supply to the contractors and for the permanent supply a 33-kV cable is now being laid from Litchard switching station.

At Bridgend we saw the brick bulk-supply sub-station with its English Electric OLC truck units controlling feeders to or from Pencoed, Bridgend U.D.C. and Litchard. The U.D.C. takes about 70 kW and runs in parallel with public supply. Travelling east on the way back to Cardiff we stopped to see the switching station at the works of the South Wales Coalite Co. into which one of the circuits on the Pyle feeder is looped and where we had a good opportunity of seeing the scheme adopted for collieries and other important consumers which permits the metering equipment to be cut out temporarily in the case of failure so as to ensure supply. The lay-out for this scheme is shown in the simplified diagram on page 673.

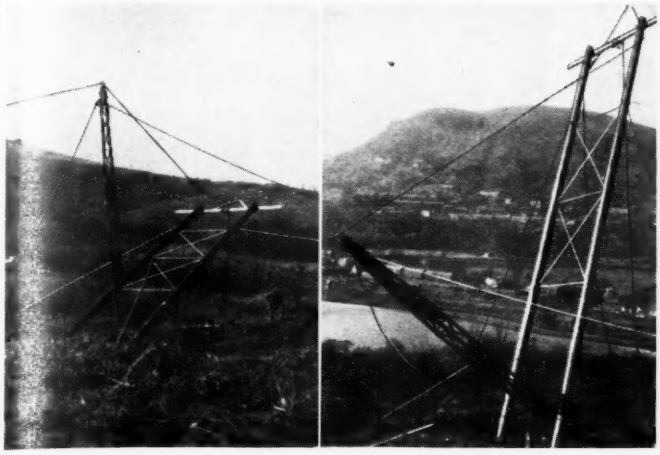
Further west we turn left up the Tonyrefail Valley where 75-kV Lapp insulators are installed on the loop line and we passed the Coedely collieries, coke ovens and brick works of the Welsh Navigation Collieries, Ltd. The final visit of this day's tour was to the sub-station of the Coedely Colliery which represents another example of parallel running of private generation and public supply.

A good start on the trip to the eastern part of the area was made on the second day by a visit to the Power Company's new offices at St. Mellons on the Cardiff-Newport Road. The extensive site is an excellent one and a large floodlighted sign is legible from the railway to the south. This area is developing very rapidly and a brick sub-station is to be built, but the present pole-transformer sub-station reminded our guide to tell us that the tendency nowadays with such structures is to install auto-close transformers instead of tetrachloride fuses. At Caerphilly it was good to see how the policy of demolishing the surrounding property on lease expiration was gradually revealing the beauties of the fine old castle.

On the road to Newport we passed Bedwas Colliery, where there is a benzole plant and to which a 33-kV loop-in has recently been erected from the Upper Boat-Old Furnace line. At Pontymister we visited the new 66-kV switching station already referred to. This is manned during the daytime and two 4,000-kVA transformers had just been transferred from Old Furnace. Two 0.15-sq. in. 11-kV cables have been run to the Pontymister steelworks to which three supplies are given—two from the new "sub" and one from the Upper Boat to Risca 11-kV line.

At the steelworks we saw the sub-station with its Ferguson

Pailin truck-type 11-kV switchgear and an excellent example of a large reversing mill drive by a motor driven from a Ward Leonard-controlled Ilgner set. We visited the Risca tarmac works, where a 3,500-gal. tar tank is equipped with a 45-kW bank of immersion heaters for maintaining the temperature



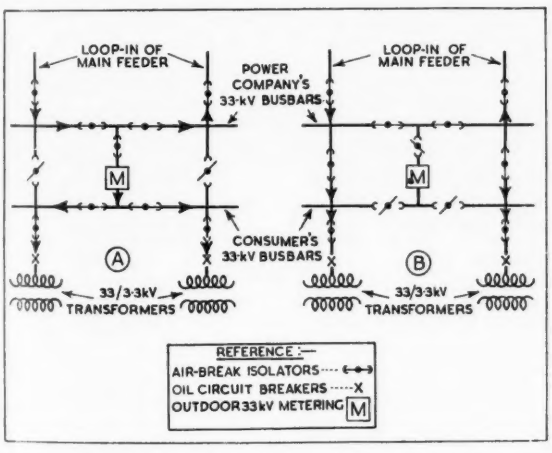
Two stages in setting up H-pole for 33-kV line erected by J. L. Eve Construction Co., Ltd.

constant under thermostatic control for 24 hours per day. The average consumption of this plant is 3.66 kWh per ton of tarmac.

Passing the Newbridge switching station we were reminded that with the Old Furnace development this will lose its importance. On the way to Old Furnace the Cramlin viaduct, with its extraordinary maze of tubular structural work, was a sight worth seeing. On the line to the Panteg steelworks from Old Furnace switching station there is a line with some very long spans. It is constructed with three separate poles, one for each conductor. Old Furnace is manned continuously and is in a rather isolated and high position on the hills west of Pontypool. In Pontypool we passed the Pilkington glass works which has two supplies, and taking the road south again we saw the Glascoed ordnance factory which is to have two feeders—one from Old Furnace and one from Cwmbran.

We visited the Baldwins steel works at Panteg, where we were privileged to see a demonstration of a new arc furnace which demands about 1,780 kVA. The supply to this furnace is controlled by minimum-oil circuit-breakers which are operated by compressed air. Cwmbran is the site of the original power station of the undertaking and, as the headquarters of the eastern division, it is still of great importance. In addition to an 11-kV sub-station with cubicle switchgear, we saw the extensive and well-equipped meter-testing laboratories and meter-reconditioning workshops, and a switchgear section in which switches are re-tanked to increase their rupturing capacity before being sent out to the outlying parts of the system.

It was a different story on the third day when we set out to



Layout of colliery sub-station providing for maintenance of supply in the event of a breakdown in the 33-kV metering equipment. (A) Normal operation; (B) Metering out of service

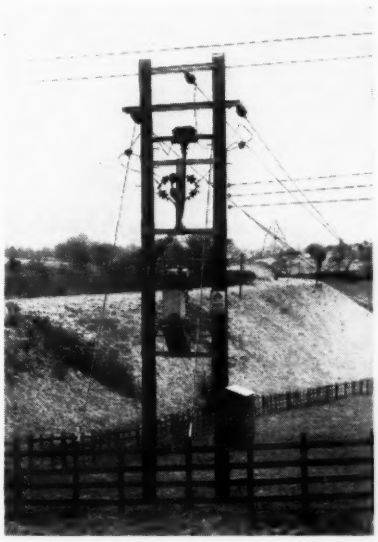
see some of the rural areas. Following the South Wales coast westerly all the way we first saw the Penarth cement works which is a recent conversion job. It is a very fine stone-built sub-station served by two 11-kV lines from the Bryn Hill sub-station at Barry. The Barry docks is a very big consumer and bulk supply is given to the Barry Council. At St. Athan many miles of overhead rural distribution lines have been replaced by underground cables on account of the new R.A.F. aerodrome.

It was very interesting to learn of the success and failure, respectively, of the co-operative and individual miners' land-settlement schemes at St. Athan. Success is attributed to managerial control and better marketing of larger quantities of products. Within a 10-mile square west and inland from this point there are about 80 sub-stations of from 5 kW up to 50 kW mainly for single consumers. Near Llanwit-Major, with its queer old and tiny Town Hall we saw a grass-drying plant. A 30-HP motor draws gas through the oven, a 25-HP motor drives the mill for making meal and a 5-HP unit serves the boiler.

On the way to the new Pyle switching station the flat agricultural land afforded a striking contrast to the mountains where we had spent the last two days. The Pyle switching station was the last we saw of the circle within which our story has so far been confined.

The Western "Annexe"

We referred earlier to the annexe to our circle which tails off to the west and includes the Gower Peninsula. The 11-kV network owned by the Amalgamated Anthracite Co. is operated in conjunction with the power company's system and bulk supplies afforded at Aberpergwm and Gwaun-Cae-Gurwen are mainly distributed along the Anthracite Company's network. The undertaking's transmission and distribution lines in the Ystradgynlais and Brynamman areas afford supplies to many colliery consumers in the anthracite coal fields. Supplies to the Brynamman area, the Swansea valley and the Gower Peninsula are purchased in bulk and we were interested to learn that the power company is the largest consumer of the Swansea corporation from which it purchases about 20 million kWh per annum.



Typical pole-type sub-station at Tonteg North

There are four points of connection with the Swansea system, two for the Gower scheme at Dunvant and Newton where supply is stepped up from 6.6 kV to 11 kV, and two at Pantlasau and a point nearer Swansea which serve the area to the north. The Manselton to Gwaun-Cae-Gurwen to Brynamman 33-kV line is of K-pole construction with 55-kV pin-type insulators and 0.05-sq. in. copper conductors. The switching station at Gwaun-Cae-Gurwen affords a 33-kV supply to the Anthracite Collieries and part of the Amman Valley and supply is obtained direct from Pantlasau sub-station by two overhead lines. It is an outdoor sub-station similar to those we have described on the main system and it represents another point of public supply running in parallel with a consumer's plant.

The Pantlasau sub-station is supplied by a double-circuit steel-tower line with 0.1-sq. in. copper conductors direct from Tir John power station and the main 33-kV line from this sub-station to Gwaun-Cae-Gurwen is of H-pole construction with suspension insulators of 0.15-sq. in. copper conductors.

A line from Gwaun-Cae-Gurwen to Lower Cwmtwrch, where a new switching site is under construction, is of A-pole construction with 55-kV Lapp insulators and 0.1-sq. in. copper conductors. The line from Lower Cwmtwrch to Aberpergwm

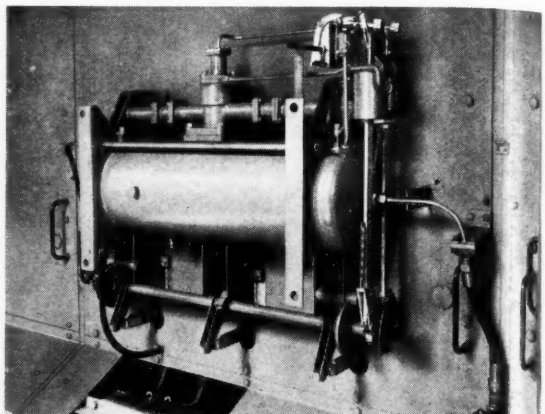
which, at present operated at 11-kV, is constructed for 33-kV working and will probably be stepped up this year.

Fortunately, we must confess, the distribution system in the Gower Peninsula is of the simplest possible character compatible with stability, for the unparalleled natural beauty of this corner of the country demanded our greater attention. It was the Welsh mountains and valleys in miniature. A very interesting point about the Gower system is that, by permission of the Electricity Commissioners, it is not earthed on the primary sides of the transformers. This is rendered possible by its electrical isolation from the greater part of the system and because of its low capacity. The result is that there is very little lightning trouble simply because the lightning surges spill over the insulators on one side, thus temporarily throwing the voltage up on the other phases. The system is 11 kV. Over 90 per cent. of the possible consumers in the Gower are connected. They are mostly domestic and farm consumers, but there are also two tiny collieries and a cockle-shell factory whose products are chicken food and toilet powder.

Briefly, the organisation of the undertaking is as follows:—A distribution engineer is in charge of the mains, sub-stations and meter departments, while the system control forms a wing to his activities. The area is divided into three mains divisions, eastern, central and western, and for each division a mains engineer and his staff are responsible for the survey, profile and wayleaves of all high-voltage and low-voltage lines and also for the construction of all low-voltage extensions and new works as well as the construction of high-voltage lines of up to about five miles long. Each mains engineer is also responsible for all maintenance work on high-voltage lines in his area and for the installation and maintenance of all pole-type transformers and switchgear.

The sub-station's department operates from the depôt at Cwmbran and the engineer-in-charge is responsible for the installation of all oil-filled and air-blast switchgear in the more important switching station. He also deals with the maintenance and testing *in situ* of transformers as well as reconditioning high-voltage switchgear.

The whole of the switching on the high-voltage network is carried out entirely to the instructions of the shift control engineer in the control department at Upper Boat. The stringent rules and regulations pertaining to the control system are very clearly laid out in a little pocket book which is issued to those members of the staff concerned.



Air chamber valve gear and operating mechanism for 33-kV air-blast switchgear

For load-building purposes the area is divided into seven districts, each in the charge of a district representative. Besides being responsible for new business the district representatives also have under their care the maintenance of the low-voltage distribution lines, the connecting of all new services, meter reading, showroom sales and local publicity.

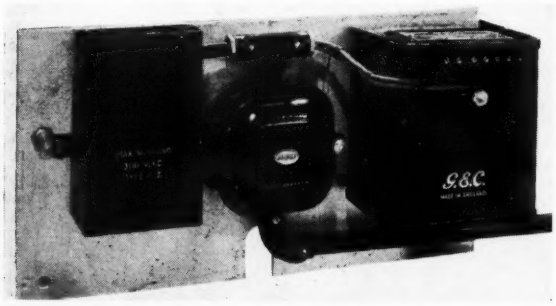
In all the technical schemes referred to in this article the South Wales Power Company's staff has worked in very close co-operation with the technical staff of the parent organisation, Edmundsons Electricity Corporation, Ltd.

Fluorescent Factory Lighting

IN November, 1937, Fisher & Ludlow, Ltd., Birmingham, purchased a new site of nearly 50 acres at Tile Hill, near Coventry, on which to erect a new production plant. In the past this company's motor body activities have been confined to the manufacture and supply of car bodies in a white metal condition, whereas the new factory is devoted to the assembly, painting, trimming and completely fitting and finishing bodies for immediate fixing to the chassis.

Fluorescent mercury-vapour lamps have been installed throughout the main production area and these give a satisfactory colour correction. The installation comprises 325 lamps of 400 W each with individual condensers. The condenser with a choke and an ironclad double-pole cutout is assembled on a steel plate specially designed to suit the roof trusses. Reflectors are of the deep concentrating, overlamp pattern, with a wide neck removable without disturbing the lamp.

Particular attention was paid to the ventilation at the top of the reflector and to the elimination of stray light to the roof. Stroboscopic effect is practically eliminated with this lighting as the powder coating emits a fairly constant light

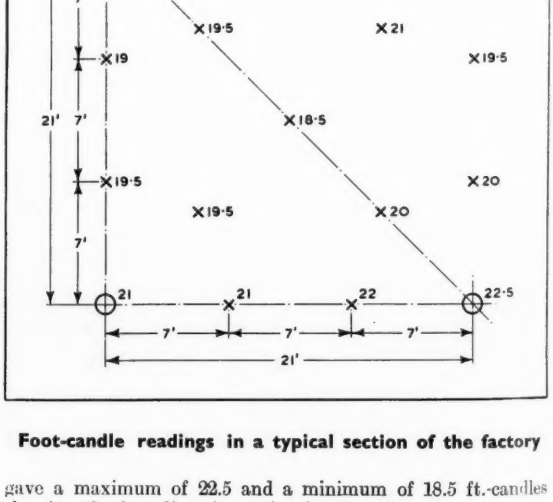


Condenser, choke and ironclad double-pole cutout assembled on a steel plate

and in addition the circuits are arranged in rows of three lamps each row being connected to a different phase.

The bays, of which there are four with no intervening walls or partitions, are each 60 ft. wide. The installation consists of three rows of reflectors per bay, the fittings being spaced at 21 by 21 ft. centres 18 ft. above floor level.

The scheme was designed to give as nearly as possible 20 ft.-candles over the entire production area the working plane being taken at 3 ft. above floor level. A series of readings taken under a typical section with a photo-electric light meter



Foot-candle readings in a typical section of the factory

gave a maximum of 22.5 and a minimum of 18.5 ft.-candles showing the low diversity ratio of 1.21 to 1.

The area lighted by one lamp is 441 sq. ft. and, taking the light output at 15,200 lumens per lamp, 34.5 lumens per sq. ft. is obtained. Watts used by the lamp plus choke and condenser losses work out at 1.05 per sq. ft. This figure is extremely low when compared with tungsten lamps to give the same ft.-candles intensity.

The scheme was designed by the company's electrical engineer, Mr. C. J. Reeves, and installed under his supervision.

THE COST OF CONTINUITY

Stand-by Plant and Bulk Supply Points

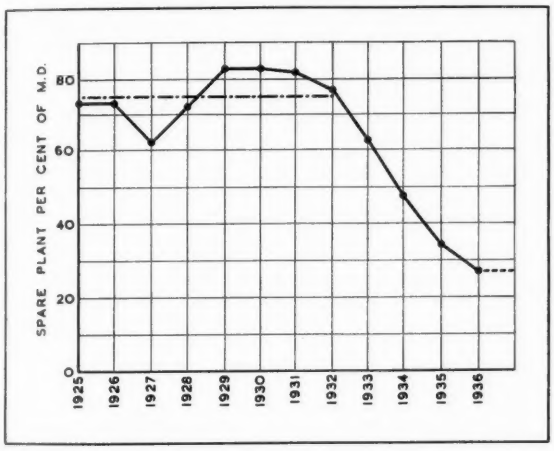
By D. J. Bolton

IT is an axiom that all design is primarily economic, and it follows that one of the chief requirements in a designer is a sense of proportion. There are no "absolutes" in design, and every good is qualified by a corresponding expense. It would be good to have more copper and so save copper loss, good to have more iron and lower flux density, and so on—but would the extra be worth the cost of obtaining it? In every direction it would be possible to spend more money and improve our machine, but in each case a point is reached of diminishing utility, and beyond this point the added gain is less than the added expense.

The object of design, in a word, is to achieve the desired result at the minimum of expense, taking all the various factors into consideration. This involves a certain balance, and the scales must be weighed between a number of rival goods, no one of which is paramount.

One reservation, however, would appear to be necessary. Security, surely, is an absolute not a relative good, and no expense can justifiably be spared in order to secure complete freedom from any chance of breakdown. On looking further into the matter, however, it is found that even this is no exception to the general rule. There is no such thing as absolute security—all one can do is to reduce the chance of a breakdown to some small fraction of one per cent. Moreover, even this small fraction can be made still smaller if we are willing to spend enough money on it. Our present standard, high though no doubt it is, still remains merely a balance between an even higher standard and the cost of producing it.

Every man, it is said, has his price, and certainly every virtue in the technical world has its cost, and is only worth while "up to a point." In the case of any given machine, such as an electric motor, the standard product of a reput-



Stand-by plant in stations of authorised undertakings

able maker may have a breakdown chance of, say, one in ten thousand. By spending £x more on its manufacture and testing, this chance might be reduced to one in twenty thousand. But such an increase would probably not be worth £x, and this is why the process has stopped where it has.

The above remarks have referred specifically to the design of plant, but they apply with equal force to the design of a supply system. In fact, the process of paying for reliability is more easily seen there than anywhere else. Apart from the question of the *quality* of the gear employed, and the payment of big prices for high-grade materials there is a certain expenditure on *quantity* which is purely an insurance premium for reliability. A certain quantity of plant is required to meet known or predictable contingencies, *e.g.*, last year's maximum demand, with an increase for the year's growth and a margin for cold snaps. But over and above this, it is necessary to have stand-by plant lying idle, even at the time of maximum peak, in the event of something breaking down.

As regards generating sets, a common plan in the past has been to imagine the largest set in the station to break down at the time of the yearly peak, and then to provide sufficient stand-by to meet this hypothetical situation. These particular figures refer to an isolated station, and must be modified when the stations are interconnected, but the principle still holds.

The purchase of these extra sets, although it forms a quantitative addition to the station, is in reality a qualitative change; its purpose is not strictly to add to the number of kilowatts but to add to the reliability of the kilowatts that are already there. Moreover, a certain proportion of the kilowatt charge can be precisely allocated to the purchase of this extra margin of reliability. The questions (which are emphasised by some recent misfortunes) are: Are we getting the best value for this expenditure? Is the sense of proportion fully operating, or are we, perhaps, spending too much in one direction and not enough in some other?

Spare Capacity Reduced

Consider first the margin of safety in the form of spare generating capacity. The accompanying graph shows the amount of generating plant in the stations of authorised undertakings in excess of the maximum demands on the same stations. The scale is per cent. of the aggregate m.d., and the base is marked in years. For ten years prior to 1932 the figure fluctuated by small amounts about an average of 75 per cent. Then the activities of the Central Board began to make themselves felt, and the figure dropped year by year to a value of only 27 per cent. in 1936.

This result is precisely what was to be expected, and in fact is one of the chief objects aimed at in the 1926 Act. An isolated station must prepare for the worst eventuality (such as the largest set breakdown at the worst time) that is at all likely to occur within the station boundaries. But as soon as stations are interconnected the group becomes the unit, and it is then only necessary to consider the probabilities for the whole. "Pooled security," whatever it may mean internationally, is a very real gain in the world of electricity supply.

In estimating the cost of security through stand-by plant, it is comparatively immaterial whether we do it on a pre-1932 basis purely in terms of generating sets, or on a later basis when the plant is generating sets plus interconnecting lines. The cost per effective kilowatt is much the same in the two cases; and as the earlier basis is simpler (since only one class of plant is involved) it will be followed here.

Allocation of Costs

It may be assumed that the average bulk supply purchaser is paying about £3 per kW of maximum demand as metered at the bulk supply point. This annual payment covers interest and depreciation on the plant, and also various expenses of a "fixed" character such as stand-by fuel, rents and rates, management, &c. The capital charges can be regarded as a direct function of all the plant (used and stand-by) but some of the other fixed expenses should more properly be taken as a function of the used plant only. (Actually only about two-thirds of the fixed expenses are capital charges but some of the remainder, *e.g.*, rents, are equally a function of total plant.)

Assume, in the first place, that the whole of this £3 is directly proportional to the total plant, not merely to the plant in use at peak time. Taking the pre-1932 basis (75 per cent. stand-by) it follows that £3/1.75=£1.14.3 per annum represents the price paid per kW of m.d. for the plant actually meeting the demand, and £1 5s. 9d. per annum is the price paid (per kW of m.d.) for the stand-by.

Modifying this estimate to allow for the proportion of fixed expenses not strictly incurred by the stand-by plant it may be surmised that about £2 per annum per kW of the bulk supply charges goes to pay for the plant actually in use at the peak time, and the other £1 is incurred in obtaining the necessary margin of security. (This estimate is, of course, only a rough one.) These figures have not altered materially since 1932, the only difference being that, in the later years, more of this £1 has gone to pay for interconnecting plant, and less for generating plant.

It is not suggested that this pound is any less necessary than the other two. In so important a matter as payment for security one hardly dares to criticise the amount; the only question is whether the proportions are right, and whether we are getting the best value for our expenditure. In electricity supply, as with transport or production, a certain general plan is essential, and it is no use multiplying the

roads to a point if there is a narrow section in the middle constricting the flow.

To put the matter in concrete terms--a distribution undertaking with a peak of 5,000 kW is paying about £5,000 a year for security in the shape of stand-by sets and interconnecting plant. But plant is not enough—there must be means for bringing it into effective action; and one result of improving the generation equipment is to shift the danger point further afield. It is useless to have all the sets in the world unless there is proper access to them, and in making certain that there is plant to spare we must make equally certain that there are spare channels to it.

Additional Supply Points

The above considerations inevitably raise the question: Should some of this money have been spent rather in obtaining alternative points of supply? A reduction in equivalent stand-by (expressed on a pre-1932 basis, of isolated stations) from 75 per cent. down to 60 per cent. of the m.d. would release £1,000 a year in the case of the undertaking instanced. If this amount were used to cover the service charges of an additional point of supply the net result might well be an increase in the overall reliability.

Actually the undertaking has no option in the matter of the kilowatt charge, but the Central Board has more freedom of choice. If the Board should decide to reduce very slightly the proportion of stand-by plant and to spend the money in lowering the price of additional supply points it is arguable that the total margin of security might be increased. Under the present grid tariff there is a service charge for each point of supply beyond one, this charge depending on the situation and the capital expenditure involved. In the future it might be possible to waive this extra, or to allow, say, one (free) supply point for every 5,000 kW of load.

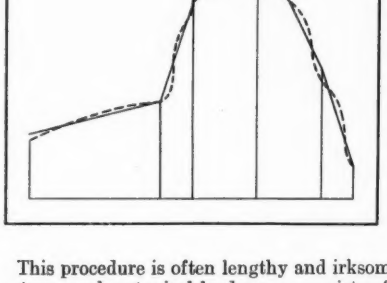
For the undertaking, the chief cost of extra supply points will usually lie not so much in the extra grid charges as in the cost of providing the additional switchgear and transformers. Nevertheless, it is a cost that may have to be faced, and it is a question that certainly must be faced. There is no sense in paying thousands a year for the emergency use of plant which any real emergency may put beyond our reach, and it is false economy not to pay a little more in order to be very much more sure of it.

Security, in fact, can be no hundred-per-cent. absolute, but is a delicate balancing of probabilities and contingencies. "There's many a slip 'twixt cup and lip," and in this case before even reaching the cup it often has to pass through a narrow bottle neck.

Form Factor of a Load Curve

By G. W. Stubbings, B.Sc., A.M.I.E.E.

THE determination of the form factor of a load curve is a matter of considerable practical importance because, knowing a typical form factor, the average heating value of a current can at once be obtained from the metered average value of this current. Given a curve representing a typical load cycle, the straightforward method of determining the form factor is first to find the average ordinate of the load curve by one of the standard methods and then to obtain a derived square curve, from which the average square, and hence the RMS value, is calculated. The factor will be the ratio of the RMS to the average value.



This procedure is often lengthy and irksome, and when, as is not unusual, a typical load curve consists of a number of segments which are approximately straight, the process of obtaining the two average values necessary for the calculation of the form factor can be greatly abridged by the approximate method now to be described.

A curve of the kind referred to is shown in the accompanying figure dotted. This curve is seen to be very approximately represented by the full line which is composed of straight segments. The approximate curve can be drawn sufficiently exactly by careful judgment, and it will be best if this approximate curve lies, on average, rather above than below the actual load curve. Having obtained this approximate curve as carefully as possible, the two averages for the determination of the form factor can easily be obtained by tabular calculation, and without drawing a square curve.

The average value of the ordinates of the actual load curve corresponding to any segment of the approximate straight line curve is evidently equal very nearly to the average height of this approximate segment. Thus if y_a is the mean of the two end ordinates of such a segment, and Δx is its base, the area of the segment will be $y_a \times \Delta x$. The sum of all such terms will be the area of the approximate curve, and this total area, divided by the measure of the whole length of the curve, will give the approximate average value of the load during the cycle.

To determine the RMS value we first observe that if a square curve were derived from the approximate straight line load curve this square curve would consist of parabolic arcs. The area of each of the segments bounded by these arcs can be found by Simpson's rule without the actual curve being drawn, because the ordinates at the ends and at the middle of the segment are known.

For the purpose of practical calculation, the areas of the segments of the square curve are best obtained by the formula given by the following algebraic transformation of Simpson's rule. Taking, for any segment of the square curve, the average ordinate y_a as a basis, then, if Δy is the increase or decrease of the ordinate y of the load curve passing from one end to the other, the actual end ordinates will be $y_a - \frac{1}{2}\Delta y$ and $y_a + \frac{1}{2}\Delta y$.

According to Simpson's rule, the average height of the segment of the square curve will be obtained by adding the squares of the end ordinates and four times the square of the average ordinate of the load curve and dividing by six. Thus the average height of the square curve will be one-sixth of the sum of $4y_a^2$, $(y_a - \frac{1}{2}\Delta y)^2$, and $(y_a + \frac{1}{2}\Delta y)^2$, where y_a is the corresponding average ordinate of the approximate load curve. This quantity is easily seen to be equal to $\left\{ 6y_a^2 + \frac{1}{2}(\Delta y)^2 \right\} /6$ or to $y_a^2 + (\Delta y)^2/12$.

Thus the average height of any segment of the square curve is obtained by adding to the square of the average ordinate of the corresponding segment of the load curve, one-twelfth of the square of Δy. It will be noted that as the square of Δy is involved in this formula, the sign of Δy is immaterial; its arithmetical magnitude only is required.

The actual calculation of a form factor value can conveniently be carried out in the manner shown in the accompanying tabular scheme, in which simple numerical values have purposely been used in order that the arithmetical processes can be easily followed.

x	Δx	y	y_a	Δy	y_a^2	$(\Delta y)^2/12$	Average y^2	Areas. Load Curve	Areas. Square Curve
0		10							
	20		12.5	5	155	2	155	250	3,100
20		15							
	5		22.5	15	505	19	524	112.5	2,620
25		30							
	10		35	10	1,225	8	1,233	350	12,330
35		40							
	10		30	20	900	33	933	300	9,330
45		20							
	5		12.5	15	153	19	172	62.5	860
50		5							
							Total Areas	1,075	28,240
							Total length	50	50
							Average	21.5	
							Average square ...		565
							RMS		23.8
							Form factor = RMS/Average = 1.11		

The first column gives the values of the abscissæ of the approximate straight line load curve, and the values of Δx represent the lengths of the segments. The ordinates y are those of the approximate curve, and y_a and Δy are the corresponding average and incremental values of y. Adding y_a^2 to one-twelfth the square of Δy gives the average value of y^2.

The two area columns refer, one to the load curve and the other to the square curve. The derivation of the required result by summation of area segments and vision by the total length of the curve is obvious. It will be noted that the method of obtaining the average square ordinate of each segment of the curve involves two slide-rule operations only.

Organisations of the Industry—XII

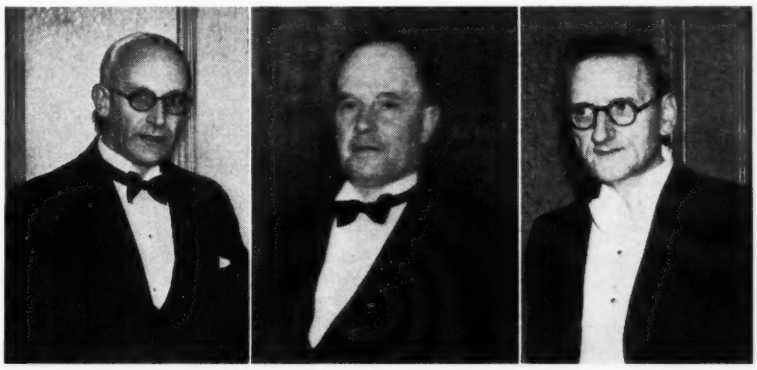
Electrical Power Engineers' Association

By W. Arthur Jones, A.M.I.E.E., General Secretary

THE younger generation of supply engineers have probably no conception of the conditions which prevailed in the electricity supply industry in the early years of this century, and, therefore, cannot form an accurate idea of the changes which have been brought about, particularly since the formation of the E.P.E.A. in 1913.

In February, 1913, there was published in the columns of the ELECTRICAL REVIEW an article entitled "Holidays in Central Stations," giving particulars of the salaries, hours of employment and holidays of charge engineers and switchboard attendants in twenty-eight undertakings with a capacity of 1,000-2,000 kW and nineteen undertakings between 3,000 and 4,000 kW. It was shown that the lowest salary in the first group for a charge engineer was 25s. per week, whilst the highest was £160 per annum. In the second group the lowest salary was 35s. per week, whilst the highest was £200 per annum.

With regard to hours of duty, the prevailing custom in those times was to consider it essential for a charge engineer to be available during the whole period that the station was running, and, therefore, the average hours per week of charge engineers were fifty-six, as only three of them were usually employed. In some stations where there were fewer than three the average hours per week were as high as sixty-four or more. When one man had any time off, his colleagues had to work overtime without additional remuneration, though slight modification of this occurred in some undertakings when, on periods of light shifts, the switchboard attendant or junior charge engineer would take over the charge engineer's duties. There were certainly a few stations where the forty-eight hour week had been put into operation, but in only five of the forty-seven undertakings referred to was this the case.



Mr. G. W. Essex, assistant general secretary, Mr. P. S. Jolin, president, and Mr. W. Arthur Jones, general secretary *[Elec. Rev. photos.*

The engineer of to-day, being unfamiliar with conditions of this kind, may well ask why such a state of affairs was allowed to exist and why men continued to work for such inadequate remuneration. There were probably two reasons for this, first, that the industry was young and growing rapidly and there were still prospects of good positions being obtained after experience had been acquired; in consequence many young engineers, with the assistance of their parents, took jobs at small salaries primarily to gain experience, although the effect was to depress the general level of salaries, particularly with respect to those who were in the industry for the sake of a livelihood. The other reason was the extreme individualism of the engineers themselves. In general they abhorred combination of any kind and preferred to play a lone hand, each man for himself, and very often men did not hesitate to take advantage of one another in their endeavours to secure advancement for themselves.

The First Steps

As far back as 1910 and 1911 the correspondence columns of the ELECTRICAL REVIEW indicated that there was a feeling abroad as to the unsatisfactory nature of the conditions of employment and salaries in the supply industry. In December, 1912, one of the correspondents intimated his desire to hear from those interested as to whether they would be prepared to take part in the formation of an Association of Central Station Engineers, and as a result of this invitation a meeting was held in January, 1913, attended by twenty-one engineers, who decided to take steps to form such an association. Subsequent meetings were held and an organising committee was formed, and at a meeting of this committee held in February, 1913, 120 applications for membership were received and passed. The movement spread throughout the rest of the country and meetings were held in the provincial centres and particularly in Manchester. The support given to the new movement was such that in June, 1913, it was able to hold its first annual conference and also to lay down the aims and objects of the new Association.

One of the earliest decisions which the organising committee had to make was in relation to the question as to whether the new organisation should or should not be based on trade union principles, and registration as a trade union was decided upon. The principal weapons to be used in the achievement of the above objects were correspondence or deputation. The new organisation considered arbitration to be the most satisfactory method of settling differences arising between station engineers and their employers and only as a last resort was more forceful action to be relied upon.

The membership of the Association had touched the 1,000 mark when war broke out, and the immediate effect was a depletion of its numerical strength and also a very natural loss of interest. During 1915 and 1916 the Association was in a state of suspended animation, but matters came to a head during 1917 on account of the various awards made to the manual workers to meet the increased cost of living—by that time it had reached a figure of 80 per cent. above July, 1914—and the lack, except in a very few isolated cases, of any similar provision on behalf of the staff worker.

Attention having been called to the existence of the Association of Electrical Station Engineers' meetings were held in different parts of the country, and eventually, in February, 1918, at a conference held in London, the name of the Association was altered to its present form and steps were taken to organise membership on a national basis. At the same time the national executive council gave its consideration to the question of the improvement of national conditions. Amongst its earliest successes was the inclusion of the technical staffs in the operation of the awards made to the manual workers, amongst which should be mentioned the 12½ per cent. bonus awarded by the Committee on Production in January, 1918. Steps were also taken to secure the proper consideration of the technical staffs in reference to the claim which led to Award 2272 made in August, 1918.

"Drastic Action" Averted

During this period also negotiations were taking place in several parts of the country in respect of a schedule of salaries for technical staffs. These negotiations did not make sufficient progress, and in October, 1918, the Association made an application upon all electricity supply authorities in the United Kingdom, claiming an advance of 20 per cent. plus £90 on pre-war salaries. This application was eventually considered at a conference representing the I.M.E.A. and the company undertakings, which recommended that the claim was justified and should be acceded to. When, however, an endeavour was made to implement this recommendation it was found that there were certain legal difficulties which prevented the supply undertakings giving effect to the recommendation, as a result of which it became necessary for the Association to issue an intimation of drastic action.

Further negotiations took place, and subsequently an arbitrator issued Award 9281, the "Stoker Award," embodying the recommendations of the conference. One of the conditions was that the parties should meet for the purpose of agreeing upon a schedule of salaries, thus laying the foundation stone of the present schedule of the National Joint Board.

The next great problem to engage the attention of the Association arose from the proposal of the Ministry of Labour, that

a National Joint Industrial Council should be formed for the electricity supply industry, and a conference held in June, 1918, agreed to this. Objections were raised, however, by representatives of the organisations of manual workers to the representation of the E.P.E.A. upon such a council, and it eventually became necessary to form a National Joint Board, consisting of representatives of the employers and of members of staffs. This decision, arrived at during a conference held in December, 1919, was subsequently confirmed by most of the employers' organisations represented.

A sub-committee formulated a schedule of salaries and conditions of employment which was published in May, 1920. At the outset there was considerable opposition on the part of individual undertakings to the idea of a National Schedule for the technical staffs, and in December, 1920, fewer than sixty out of over 260 undertakings coming within its scope had adopted it. By a vote representing a large majority of the membership it was decided that drastic action should be taken. Fortunately, and mainly by the good offices of the Ministry of Labour, it became unnecessary to give effect to this threat and from that time to the present the National Joint Board schedule has been generally recognised throughout the country, although during the period 1920-1923 many problems arose in individual undertakings relating either to the operation of the schedule itself or to an interpretation of its provisions.

Although the percentage of unemployment amongst the members of the Association has never been a high figure, the national conditions in 1922 caused an increase in the number of unemployed members, which demanded consideration by the National Executive Council, and as a result the Association instituted its unemployment fund, which has been in operation from 1922 to the present day. At about this time also the question of members who through ill-health or other causes might be in straitened circumstances demanded consideration, and the Association instituted its benevolent fund. Some two or three years later it included within the benefits of its benevolent fund the payment of a death benefit of £50 to the relations and dependents of all deceased members in benefit.

Relations with Unions

Adverting to the schedule, the opposition of individual undertakings eventually crystallised itself in hostility to certain individual clauses of the conditions with the result that in 1922 negotiations proceeded on the National Joint Board in connection with a revision of the schedule. These negotiations were eventually concluded early in 1923, but during their progress the publication of agreements with two of the operative unions as to the policy and action in connection with the disputes which arose between either of them and the employers in the industry caused the employers' side of the Board to intimate that until the agreements were cancelled they would refuse to continue their representation on the Board. Eventually in March, 1923, at a conference called under the auspices of the Ministry of Labour an agreement was arrived at by which the agreements in dispute were cancelled and the employers' side of the Board agreed that the Association had entire freedom of action in the case of those authorities which were not parties to the Boards and Councils, provided that such action was confined to these.

A further activity of the Association during this period was in connection with the compensation provisions in the Electricity Supply Acts. It took a leading part in connection with the inclusion of the compensation provisions in the 1919 Act and also the amendments contained in the 1922 Act. Since the passing of the 1919 Act the Association has negotiated on behalf of 121 claimants, the aggregate compensation amounting to £74,830. In addition, and in conjunction with other associations, it has since that time, through the medium of a joint committee, taken steps to secure the insertion of, or amendment to, compensation provisions in all relevant Parliamentary Bills, both public and private.

Educational Activities

On the educational side, from the earliest days the activities of the Association have been very considerable. At the outset these activities took the form of inaugurating and arranging technical lectures to its members, but at a later stage it became necessary to organise the Technical Groups. These groups are comprised of members of the Association and also technical members who generally are the engineers on the staffs of manufacturing firms and can become members of the Technical Groups without any obligations or responsibilities as members of the Association proper. This association of makers of apparatus and machinery and the users thereof has been of inestimable benefit to both parties. A further educational activity of the Association has been its correspondence tuition scheme, which was instituted to meet a particular demand of members who, for various reasons, were dissatisfied with existing facilities. This scheme has met with notable success.

In a short article of this description it is not possible to more than indicate some of the salient features of the Association's history, but that history is by no means finished. The work of the National Joint Board has removed a great many of the problems which troubled the Association in its early days, but there are still many outstanding grievances. The columns of its journal, the *Electrical Power Engineer*, have recently indicated one very clamant question, *viz.*: The hours of employment of shift workers and their demand for shorter duty.

Another question of interest to both employers and employees is the provision of a greater number of designated grades in the N.J.B. schedule, a matter which will require the agreement of undertakings to certain measures of standardisation of staffing arrangements. For many years now the charge engineers have been dissatisfied with their allocation to Grade 8 of the schedule and their demand for increased grading has been strongly reinforced not only by the development which has taken place in modern times of the technical practice and efficiency of generating stations, but also by the greatly increased duties and responsibilities put upon this grade of employee and his colleagues in the generating station since the advent of the grid.

One of the most remarkable features of the schedule has been that since 1920-1923 it has operated fairly satisfactorily throughout the industry despite the many changes which have taken place since that date, which have made its clauses to a very large extent obsolete. A revision is long overdue, and it is desirable that the schedule should be brought into line to deal with existing conditions.

An Electrified Mixed Farm

PARTICULARS of the power equipment of a 450-acre farm (grass and arable) which has recently gone over to electricity are given in the *Farmer & Stock-Breeder*. Formerly the machinery at Anick Grange, Hexham, was driven by a fixed steam engine, but individual electric drives have enabled the positions of the machines to be altered to facilitate working. Thus, a threshing machine built into the barn can be used in wet weather; it has a 4 ft. 6 in. drum and is driven by a 15-HP motor mounted on the floor above out of the way of chaff and dust. Arrangements are to be made so that the latter can be blown through an 8-in. pipe to a receptacle 25 yd. away.

The grain, in sacks, is raised by a 4 cwt. electric hoist (which also deals with cattle food) to the granary in which is electrically operated winnowing plant. A grinding mill driven by a 10-HP motor and a crusher driven by a 7½-HP motor installed on the ground floor prepare grain for live-stock feeding. A 60-gal. thermostatically controlled water heater in the mixing room provides hot water for calves' food. Above the mixing room a 6-HP motor drives a chaff-cutter and cake breaker. A 1½-HP motor driving a turnip cutter is suspended from the floor above, and a 2-HP motor drives a self-cleaning turnip cutter. A 1½-HP motor on a potato sorter is fed by a trailing cable. Main buildings lamps are up to 250 W.

In the dairy there is an electrically driven washing machine and provision has been made for the installation of a milk-cooler of the refrigerating type to reduce the temperature of the milk from 90 to 38 deg. in one operation; this will require a 3-HP motor. There are also a 1½-HP milking machine for the eighty cows, together with electric horse clippers and electric shears for the sheep. A reflector heater has been found beneficial in the pig farrowing house. In the poultry section are 250-egg Gloucester and 220-egg Curfew electric incubators and also six Stuwa heating boards each controlled by a three-way switch.

The farmhouse installation includes a 10-kW cooker and a 12-gal. thermostatically controlled water heater, a washer in the scullery, a 5-pint kettle, radiators and irons. Electric light is also installed in five adjacent cottages; all have irons and kettles and two of them cookers. The change-over to electricity was carried out under the supervision of Mr. H. D. Phelps, agricultural engineer of the North-Eastern Electric Supply Co., which supplies 10,000 kWh per annum for general purposes and a similar amount for water heating. The testimony of the tenant, Mr. W. Laidler, is that he could not carry on the farm efficiently with his present staff without the aid of electricity.

SUPPLY FAILURES

Reports on the Kingston and Fylde Coast Breakdowns

TWO reports have been issued this week by the Electricity Commission. They relate to the failures of supply at Kingston on December 14th and on the Fylde Coast on January 6th, and are obtainable from the Stationery Office at 2s. 6d. and 1s. 6d. A public inquiry into the former was opened on December 16th by Mr. Henry Nimmo, Chief Engineering Inspector, Electricity Commission, with whom was associated Mr. A. J. McColgan, Deputy Senior Electrical Inspector of Factories. (ELECTRICAL REVIEW, December 23rd and January 20th.)

Kingston generating station is operated by the Corporation on behalf of the London and Home Counties Joint Electricity Authority in conjunction with the Central Electricity Board. It is equipped with five Ljungstrom turbo-alternators having a total capacity of 11,750 kW. The 3.3-kV switch gallery (from which are controlled the alternators and local supplies) was extended in 1930 to accommodate eighteen 11-kV units, two of which belong to the Corporation, three to the C.E.B. and thirteen to the J.E.A. The 3.3-kV alternators are connected to the 11-kV switchboard through two 3,750-kVA transformers one of which was at the time of the accident being installed in a new cubicle outside the generating station.

The grid connection was by means of three 15,000-kVA 33/11-kV transformers situated close to the generating station. Nos. 1 and 2 were supplied direct from Wimbledon grid sub-station and No. 3 from the 33-kV grid sub-station (fed by two cables from Wimbledon) about 100 yd. from the generating station.

Last year the joint owners of the 11-kV switchgear decided to replace the hand-operated circuit-breakers by G.E.C. 350,000-kVA solenoid operated breakers and to remove the control panels to a separate switch-house in which the Corporation had installed new 3.3-kV switchgear. The scheme was to be in accordance with the recommendations made in 1938 by the Fire Risks Investigating Committee.

Origin of the Kingston Fire

On December 13th the manufacturers' erector obtained a permit-to-work card from a C.E.B. engineer to work on an 11-kV feeder switch. He incorrectly assumed that the feeder connected to the current transformer spout contacts was dead, and at 4.17 p.m. on the following day he flashed the red-phase contact to earth to get rid of static voltage. An arc started, cracking the porcelain current transformer spout insulator and allowing oil to run out and cause a fire, which spread so quickly that the portable extinguishers could not be used.

Soon after the fire started the bus-bar chambers immediately above the circuit-breakers were damaged and a bus-bar fault developed, causing C.E.B. No. 3 switch at Kingston grid sub-station and C.E.B. No. 1 switch at Wimbledon to trip. At about the same time the 3.3-kV switch controlling the 3.3/11-kV transformer at the generating station was opened by hand, separating the Kingston system from the 11-kV system. The tripping of these three switches cleared the bus-bar fault. No. 2 C.E.B. switch at Wimbledon did not open automatically as the protective circuits had been removed under a misapprehension and the fault on the feeder continued for five minutes after the original fault occurred, until C.E.B. No. 2 transformer broke down causing C.E.B. 3 and 4 switches and the section switch at Wimbledon to come out, thereby cutting off all supplies to the 11-kV system.

Kingston fire brigade arrived within five minutes and the fire was extinguished by 6 p.m. The whole of the 11-kV board was damaged beyond repair, except No. 3 C.E.B. switch (in a separate annexe) and one control panel which had been removed to the new switch-house. Supplies to Kingston consumers could have been restored within an hour if the 11-kV switchgear had been installed in a separate switch-house. The restoration of local supplies was facilitated because new 3.3-kV switchgear was available in a separate switch-house.

With the protective gear on C.E.B. No. 2 feeder disconnected, the fault current (limited by earthing resistance) was insufficient to operate the back-up overload relays at Wimbledon. The failure of the back-up (unrestricted earth-leakage) protection to clear Nos. 1 and 3 feeder switches before the overload protection operated appears to have been due to very early damage to the circuit wiring.

It is probable that had C.E.B. No. 2 feeder tripping links not been removed and the wiring of the control panel at Kingston disconnected, the protective gear would have operated within 7 sec., and there would have been no fire. The C.E.B. official who gave instructions for this removal assumed in error that the feeder was dead. The official receiving the instruction should have pointed out that the feeder was still alive and in issuing the permit to work should have notified the erector that the current-transformer spouts were alive.

Mr. Nimmo's recommendations are: (*a*) the 11-kV switchgear for giving supplies to the J.E.A. should be installed in a switch-house entirely separate from Kingston generating station and designed in fullest accordance with the recommendations of the Fire Risks Investigating Committee; (*b*) the rearrangement of other switchgear, transformers and associated equipment should conform, as far as practicable, with the same recommendations; (*c*) the provision of an alternative source of supply to Richmond and to Walton and Weybridge, or other portions of the area affected should be considered by the authorities concerned; (*d*) where high-voltage switchgear at the same location is owned by two or more authorities, the closest co-operation between their engineers is essential, and a common form of permit-to-work card should be adopted; (*e*) where a generating station contains high-voltage equipment belonging to other undertakings, work on such equipment should be carried out only with the full knowledge and approval (as regards time and place) of the official in charge of the station; (*f*) a high-voltage conductor should not be flashed until it has been definitely ascertained, by an instrument designed for the purpose, that the conductor is dead.

Fylde Coast

The second inquiry concerned the breakdown of the transmission system from Preston to Blackpool, Lytham St. Annes and Fleetwood on January 6th (ELECTRICAL REVIEW, January 13th). Mr. C. B. Thompson, Engineering Inspector, Electricity Commission, and Mr. S. J. Emerson, Electrical Inspector of Factories, sat with Mr. Nimmo.

The Fylde system layout includes four 33-kV feeders, partly overhead and partly underground, between Ribble power station (Preston) and Blackpool power station. Nos. 1 and 2 feeders are looped into a switch-house at Peel, from which duplicate feeders in each case go to Fleetwood and to Lytham. At the time of the occurrence the Preston-Peel section of No. 2 was out of commission for repairs and the switch at Peel controlling the Peel-Blackpool section of No. 1, as well as the bus-bar sectioning switch at Peel, were open in order to avoid excessive load on the Preston-Peel section of No. 1.

At 4.46 p.m No. 1 switch tripped on fault at Preston, but not at Peel. It was closed immediately, but tripped again. At the same time, apparently, the switch controlling the 33-kV neutral earthing transformer at Preston tripped.

Unaware that the neutral was unearthed and that No. 1 feeder switch at the Peel end was still closed, a senior official ordered the closing of the switch at Peel controlling the Blackpool section of No. 1 (*i.e.*, on to the faulty No. 1 Preston-Peel section) in order to ease the load on the No. 2 Peel-Blackpool section. Thereupon Nos. 3 and 4 Preston-Blackpool feeders tripped, shutting down the system.

After racking out the switch at Peel on the Preston-Peel section of No. 1 feeder, Nos. 3 and 4 feeders were again made alive, the neutral being still unearthed. They at once tripped and it was found that No. 3 feeder had broken down 700 yd. from Preston, that holes had been blown in the metal casing of the 750-MVA bus-section switch at Preston and of the 500-MVA No. 4 feeder switch at Blackpool. Other damage included the fracturing of the cross-over chamber between the bus-section switch and a transformer switch, causing the ejection of burning compound which damaged the ends of Nos. 1 and 2 feeders at Blackpool. A fire was quickly put out by portable CO_2 extinguishers.

Mr. Nimmo exonerates the staffs of Blackpool, Fleetwood and Lytham St. Annes Corporations as well as the Central Electricity Board from responsibility for the complete cessation of supply, which he attributes largely to lack of co-operation between two of the Preston Corporation officials. He concludes by recommending: (a) Closer co-operation between generating and distribution staffs of Preston Corporation; (b) the carrying out fully and immediately of the recommendations of the Fire Risks Committee at Preston and Blackpool generating stations and at Peel switch-house; (c) the replacement of the belted 33-kV cables in Nos. 1 and 2 Preston-Blackpool feeders by those of modern design; (d) the putting in hand without delay of a scheme (already prepared) that provides for additional feeders and separate switch-houses at Preston and at Peel.

VOLTAGE STANDARDISATION

Position and Prospects

By L. Romero, M.I.E.E.

(Chief Engineer and Manager, Salford)

THE history of the standardisation of voltage in this country goes back to 1904 when the Engineering Standards Committee issued Interim Report No. 17 fixing the standard low voltages for both DC and AC, measured at the consumers' terminals, as 110, 220, 440 and 500, and also gave the standard voltages on the secondary terminals of transformers as 115, 230, 460 and 525.

At that time, and right up to 1921, the question of standard voltages was considered from the point of view of generators working on existing systems, and later with an eye also to the difficulty of making lamps exactly suitable for a desired voltage.

The range of voltages given above was selected because it was a mean between those then in existence and would enable standard generators based on one or other of these standard voltages to be used on any supply system. The idea of ever being able to give a supply at one and the same voltage to all consumers throughout the country did not take practical shape until the early 1920's.

This fixing of 220 V as standard in 1904, and later of 200 V as the standard for AC only, must, of course, have had the effect of extending the use of those voltages right up to the end of 1925 when 230 V was made standard.

In 1907, Interim Report No. 17 was superseded by Report No. 36 in which consumers' voltages remained unaltered, but 115, 230, 460 and 525 V were made standard at the terminals of the generator instead of the transformer. In 1915, Report No. 72, superseding Report No. 36, was issued, and maintained the same range of consumers' standard voltages for DC but introduced a different range for AC, namely 200, 400 and 500 V. In 1921, Specification No. 77 for the first time specified "voltages for new systems and installations," giving the same two distinct ranges of voltages for DC and AC respectively as those mentioned above.

A few years later E.L.M.A. proposed that there should be one standard voltage only, presumably because the difficulties of producing lamps for a single rating had been overcome. After very full discussion and consultation with the Dominions it was eventually agreed to adopt the mean value between 220 and 240 V, namely 230 V, as the sole standard for both AC and DC, and this, the present standard, was adopted in revised B.S.S. No. 77 issued in November, 1925.

It seems clear from the above that no blame, but rather credit, should be attached to any supply authority for adopting or extending supplies at 200 or 220 V right up to November, 1925. On the other hand, the authorities which were fortunate enough to be already supplying at 230 V in 1925 obviously deserved no special credit for having adopted and/or extended a non-standard voltage.

Investigation by Commissioners

The Electricity Commissioners are at present collecting from all undertakings supplying at or below 230 V information which will show the position and prospects of supply voltage standardisation throughout the country, with the exception of 240- and 250-V supplies, and it is to be presumed that this information is being obtained with a view to subsequent action being taken on a national scale to speed up and complete this standardisation which is so much to be desired.

Without the precise information at the disposal of the Commissioners the matter cannot be discussed in any close quantitative way but, regarded merely as a question of the relative numbers of standard and of non-standard voltage consumers in the country, it may be stated with confidence that very considerable progress towards standardisation has been made since the present standards of supply voltage, system and frequency were laid down in November, 1925. Unfortunately, however, this progress has been confined to some only of the undertakings supplying at non-standard voltages, and there are still many undertakings, large and small, which have done little or nothing to bring themselves into line.

The disadvantages of having more than one supply voltage in a single undertaking must be so evident to every supply engineer who has had experience of such a state of affairs that it may be anticipated that standardisation will be carried through to completion voluntarily in almost every undertaking in which it has once been started. The real problem, therefore, seems to be to ensure that it is at least started in every undertaking, and one method of producing this result was suggested in a paper which the writer presented at the Liverpool I.M.E.A. Convention in 1934 in the following passage:—

> "The present complete freedom which undertakers enjoy of extending their systems at non-standard voltages should at least be taken away. If undertakers were compelled to adopt the standard voltage for all new network transformer sub-stations it would be a powerful lever to induce them to change the whole of their consumers to standard voltage, as no one likes to have more than one supply voltage in his own area."

If this suggestion had been adopted at that time complete standardisation would probably have been in sight by now without the need for any further coercion, but after five years' delay, and the very rapid growth of the supply industry which has taken place, the position is, of course, much more difficult and more drastic measures will probably be required.

Among the advantages of having the same supply voltage and system throughout the country the following may be mentioned:—(1) National prestige would benefit, at least in the electrical world. (2) Network transformers and mains cables could be standardised with advantage to delivery period and cost. (3) Manufacturing and stocking lamps, motors and all other consuming devices for one voltage only should enable prices to be reduced. (4) Consumers would never be faced with the trouble and expense of having to provide new devices or elements when moving from one locality to another.

Replacement of Apparatus

The author has had practical experience in changing large numbers of consumers from three different voltages, namely, 200, 220 and 240 V to 230 V, and one or two points in connection with these changes may be of interest to others. In changing from 200 to 230 V it was, of course, necessary to replace all lamps and all heating elements in fires, cookers, &c. The great majority of wireless sets, however, were found to be suitable for both voltages. Motors also require changing with the exception of small fractional horse-power motors rated at 200-230 V or 200-250 V, the latter being a rating practice now adopted by a number of manufacturers.

On the other hand, in changing both from 220 V and from 240 V to 230 V eleven years ago it was not found necessary to renew any consumers' lamps or other apparatus whatever. Before the changes were made all consumers to be affected were informed by letter of the undertaking's intention and of its reasons for carrying out the change to the national standard voltage. They were also told that it was not considered necessary or advisable to renew their consuming devices when the change of voltage was made, but that only 230-V lamps, &c., should be purchased in future. A few protests were received, but no great difficulty was experienced in convincing these people that the undertaking's proposals were reasonable and in the best interests of its consumers. The change from the 220-V pressure used on the DC system was carried out in two steps of 5 V each, with a six months' interval between them.

It may be said of changes carried out on the lines indicated above:—(1) That the considerable cost of changing from 200 to 230 V should be largely offset in the long run by the substantially increased carrying capacity of the low-voltage network; and (2) that the cost of the small change from 220 or 240 to 230 V is relatively trifling and should be well within the resources of all supply undertakings.

The stumbling block to standardisation is, of course, the unwillingness of the remaining non-standard undertakings to meet the cost of the necessary change in their own areas, although many undertakings have already shown that a complete voltage change-over can be carried through without assistance from outside and without impeding electrical development.

Meeting the Expense

There are several possible answers to the question of who is to pay for completing national uniformity of voltage, but in my opinion the standardisation of all supply voltages (except 250 V) could now probably best be achieved by requiring all undertakings concerned to change all their supplies to 230 V within a period of, say, five or seven years at their own expense.

The most difficult and expensive change is from 250 to 230 V,

MEETINGS AND DISCUSSIONS

Increase in Institution Membership. Superimposed Control as an Aid to Development

I.E.E. Annual Report

THE report of the Council of the INSTITUTION OF ELECTRICAL ENGINEERS which was submitted to the annual general meeting (the sixty-seventh) in London yesterday (May 11th) shows that during the year ended March, 1939, the membership grew by 792 to a total of 19,044, while 129 members died.

There were 606 candidates for graduateship examinations at nine centres at home and ten overseas; also 279 holders of national certificates in electrical engineering were examined in English only at various centres at home. In addition, 40 theses were submitted as alternatives to the graduateship examination. National certificates and diplomas in electrical engineering awarded in England and Wales totalled 1,423 and 61 in Scotland; eight scholarships and three grants were awarded.

The report records the I.E.E.'s co-operation in the establishment of a central register by the National Service Department of the Ministry of Labour and explains why the Institution is preparing an additional separate record of its own members' qualifications.

During the year 555 meetings were held in London and at local centres by members, the Council and various committees; 350 members and ladies took part in the summer meeting last year at Birmingham.

The president attended functions at a number of provincial centres and, in addition, in accordance with a scheme put into operation last year, the four vice-presidents attended various local meetings, so helping to maintain contact between local committees and headquarters.

The Meter & Instrument Section membership grew by eleven to 726 and the attendance at its eight meetings averaged about the same at 114; short demonstrations of apparatus and processes are welcomed. The one-day summer meeting in the Manchester district attracted 100 members and ladies.

The Transmission Section membership increased by three to 1,683, but the attendance at its seven meetings fell to 98. Nearly 90 members and ladies attended the summer visit to the North Wales Power Co.'s area and 48 paid a week-end visit to Belgium, arranged by the Union des Exploitations Electriques and the Association des Centrales Electriques Industrielles; 218 members and guests attended the annual section dance.

The Wireless Section membership increased by 112 to 1,079 and the attendance at its seven meetings grew materially to 195, apart from an average attendance of 130 at three informal meetings; 65 members paid a summer visit to the G.E.C. works at Wembley.

Suggested new sections to deal with education and installation have not materialised; the Council feels that the subject of education does not lend itself to treatment by one special section, but efforts are to be made to obtain more papers on this subject.

The attendance at the eleven informal meetings remained unaltered at 65, apart from three joint informal meetings held in turn at the Electrical, Civil and Mechanical Institutions. The membership of the nine Students' Sections reached 4,365, an increase of 201, including 2,004 graduates up to the age of 28 years.

The Joint Committee on Engineering Co-operation Overseas, on which the eight constituent Institutions of the Engineering Joint Council are represented, is now functioning in an endeavour to foster co-operation between their members overseas.

Local library facilities are available at thirteen I.E.E. provincial centres. To the reference library at London headquarters 668 books were presented during the year and 107 volumes were purchased. The number of readers increased slightly to 7,233, of whom 1,013 were non-members; 93 new volumes were added to the lending library and 2,910 books were issued to 1,196 borrowers.

President to Visit New Zealand

During the year the Institution was represented at a number of anniversary celebrations and conferences. Dr. A. P. M. Fleming (President) is to represent the Institution and read a paper at the New Zealand Centennial Engineering Congress to be held at Wellington in February, 1940.

Regulations in connection with earthing to water pipes have been issued; new editions of the regulations for the electrical equipment of buildings and of ships are expected to be published during the present year. A new edition of the Model Form of General Conditions for Contracts is now available (revised, 1939), Section A covering the supply of plant and materials at home and the execution of work connected therewith. Section C, for the sale of goods other than cables at home, is at present being revised.

The Operating Theatres Electrical Apparatus Committee which has been set up with the concurrence of the Ministry of Health has commenced its sittings. It includes representatives of various medical bodies, the manufacturers of electro-medical apparatus and the Wiring Rules Committee. It will co-operate with the British Standards Institution and has set up two sub-committees to deal respectively with (*a*) equipment and installation and (*b*) static electrification.

The I.E.E. financial accounts are not referred to in the report, neither were they last year. From the benevolent fund grants totalling £3,826 were made to 73 persons, providing for the necessities of 64 dependants. The Fund's surplus at the end of the year was £1,560, donations and subscriptions totalling £4,066.

Voltage Standardisation—

(Continued from preceding page)

as in this case not only would the majority of consuming devices have to be changed but the undertaking concerned would also suffer a reduction in the kilowatt carrying capacity of its low-voltage network. This change would therefore seem to merit financial assistance, either from the national exchequer or from the industry.

Bearing in mind the way in which frequency standardisation was financed, it seems opportune to say at this time that undertakings which have already tackled the task of voltage standardisation in their own areas at their own expense should not be required to contribute towards the expense of similar standardisation by other undertakings, and that any attempt to include such a proposal in a national scheme would be most strenuously resisted.

There cannot, of course, be complete standardisation of supply voltages for both lighting and power without complete standardisation of supply systems, involving the conversion of all DC, single-phase and two-phase networks to standard three-phase four-wire. In addition to the desirability of complete standardisation of all consumers' apparatus it is obvious that in a single supply area the full advantage of being able to interconnect low-voltage networks and of standardisation of transformers, switchgear and cables can only be realised if the same system is employed throughout the area. Where this desirable state of affairs does not already exist there are therefore strong reasons for bringing it about, and in a number of undertakings, including the one with which I am connected, the necessary changes of system have either been completed or are in hand.

Many single-phase and other non-standard networks must require strengthening or substantial renewal as a result of the enormous development of domestic load which has taken place during the past ten years. If advantage is taken of this opportunity to change over to the standard three-phase, four-wire system the undertaking doing so should never have cause to regret the step.

Superimposed Load Control

TARIFFS in conjunction with superimposed control for load-levelling were discussed in a paper by Mr. D. J. Bolton (The Polytechnic, Regent Street, London) which was read before the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London, on May 10th.

The author assumed the feasibility of some system of remote control capable of sending out several distinct signals for actuating circuit relays. He pointed out that past development had occurred chiefly in spheres in which electricity was markedly superior to other agents, and where its purchase from public mains was more convenient than private generation. Now that those spheres had been fully exploited, the time had come to explore some of the less obvious markets.

Two obstacles were both related to the high cost of peak supplies. One arose because present tariffs were so empirical that it was impossible to make a close quotation; and the other was that some uses of electricity had so relatively low a yield that they could scarcely carry any peak charges. The

author's endeavour was to show how superimposed control could be employed in connection either with paying for the peak or with avoiding it.

It was natural for supply engineers chiefly to appreciate their own point of view and to lose sight of the essentially dual character of the transaction. The purchaser would only consent to consume so long as each kWh he bought added to his pleasure and satisfaction as much as it took from his pocket. The seller must in a similar way obtain more than he gave; hence he would refuse to part with an additional kWh for a smaller sum than its production added to his expenses. The price must be between these limits and in general consumption would tend to expand until the two limits coalesced.

Therefore, in reviewing tariff structure it was important to distinguish its two elements, namely, form and size; and also to differentiate between producer's (costs) and consumer's (utility) aspects. Could superimposed control, without interfering with the proved popularity and "utility" representation of existing forms, modify them in the direction of closer cost representation?

Suggested Industrial Tariff

The author's suggestion for industrial purchasers was that the running charge of a two-part tariff should consist of a block rate of not more than three blocks, the final price being one-half to one-third the first block price. In addition, there should be a fixed charge for demand, metered only at certain specified times of day and year. This would involve some sort of superimposed control, and the undertaking would also have to decide the times during which the peak might occur.

As an example he gave 1.5d. per kWh for the first 1,000 kWh per annum; 1d. per kWh for the next 9,000 kWh per annum; and 0.5d. per kWh for all additional consumption beyond 10,000 kWh, plus a fixed annual charge of £5 per kW for all demand occurring between 4 p.m. and 6 p.m. during the months of November to February inclusive.

Such a tariff, suitably adjusted to local conditions, could be made perfectly competitive and attractive to consumers, who could very rarely generate more cheaply themselves. The final rate could, when necessary, be brought down to only just above incremental costs, since the undertaking was absolutely covered on peak charges.

Meanwhile, the consumer need only bother about his maximum demand at the times when it really mattered, those times being approximately one-twelfth of his total working hours. Power-factor costs could be covered by basing the fixed charge on kVA instead of kW, since the great majority of power-factor expenses (including the grid charge) were of the nature of fixed costs. Reactive consumption at other than peak times was relatively unimportant.

Method of Operation

The normal Hopkinson tariff based on kW demand involved: (*a*) a Merz attachment to the energy meter; (*b*) a time switch allowing one portion of the demand mechanism (at periodical intervals) to return to zero and come into mesh once more. Under the proposed tariff, in place of (*b*) each meter would have a relay responsive to the superimposed control. There would be one time switch only, at the transmitting station, and this would perform its functions every half hour as before, but only during the 4 p.m.-6 p.m. periods specified in the tariff. Thus the consumers' meters would record demand only at the times and for the periods desired by the distribution engineer. There was no need for this time to be the same throughout the system and if load conditions altered the times could be changed, by agreement with the consumers, without any change in the equipment whatsoever.

The chief contribution of superimposed control to the domestic situation in this country would appear to be of a supplementary nature. Although the all-in tariff remained in possession of the major part of the field there were many cases of a marginal character which it could not hope to cover, and for these an off-peak rate should be quoted.

A general reduction of the running charge below about ½d. per kWh was risky economically unless the fixed charge was unduly high. It was also unnecessary commercially for most of the services now covered.

A preferable plan was, without disturbing or irritating the consumer with complicated changes and explanations, merely to offer him some additional kWh at a cheap rate for special purposes. The terms would include the liability of an interruption of these kWh for a maximum of, say, 200 hours a year and for not more than two hours consecutively. There seemed no reason why 3 kWh a penny should not be offered for a service of the above kind, or 4 kWh a penny for a purely night service. This could be put forward as a simple flat rate for commercial loads, such as office heating, or as a supplement to the two-part tariff for domestic loads.

Here and There

By "Nomad"

I HAVE strongly believed for many years—and developments with time have repeatedly confirmed my conviction—that although the "uncontrolled" development of high-temperature electric heating is bringing increased business to the manufacturer and load to the supply undertakings, it is definitely retarding the broader development of whole-time electric space heating which, I feel sure, will come eventually, if only by reason of its inherent advantages.

Obviously, before low-temperature heating can be advanced as a system which the electrical industry can offer exclusively as a scientific and practical scheme to give comfort conditions of heating in almost any type of building to a far greater extent than can be obtained by any medium other than electricity, the electrical industry must make up its mind as to what is implied by low-temperature heating.

* * *

Present ideas on the subject are very conflicting. I have heard low-temperature heating referred to as implying a temperature condition of the air in a room, low wattage density of heating elements, low inlet and exit temperatures (in the case of convectors), and so on. I am at present using in my home a standard convector, quite definitely and intentionally as a particular convenience, as a high-temperature equipment. I have been told that this is a most unusual thing to do. I agree that that may be so, but I must insist that the ease with which it can be done, the convenience it affords under certain conditions in a house not equipped for low-temperature heating as a system and the absence of advice or instructions to the consumer on the correct way to use the equipment all combine to make it probable that convectors may be extensively used in this way.

This assertion has been countered by the statement that tubular heaters can be installed as a high-temperature system if sufficient of them are included or if the load density is high enough. I certainly agree with this, too, and the same argument can be applied to wall and ceiling panels, although there is less likelihood of "abuse" in the case of fixed equipment. But the point I want to stress particularly is the absolute necessity of using equipment as a heating system with properly designed controls.

* * *

Mr. Carter, of the British Thermostat Co., Ltd., told me recently of the great apathy he had found among electrical contractors generally towards electric space heating on a system basis, and I have often been asked why it is that greater headway is not made in so important a matter. My answer is this: System heating of almost every kind has been, and still is, in the hands of heating and ventilating engineers who, as a body, are steam and hot-water specialists, and the development of electrical high-temperature equipment has robbed the industry of the incentive to take electrical system heating into their own hands.

* * *

While feeling as strongly as I do that electricity is the only medium by which the scientific principles of space heating can be applied commercially, in the light of modern ideas of the relationship of radiation, convection, humidity, &c., to human comfort, I strongly oppose the occasionally voiced idea that the electrical industry should divest itself from association of any kind with the heating and ventilating industry. This would be absolute folly because electrical men have got much to learn from heating and ventilation engineers, and it is up to the former to help to make the latter electrically minded. In other words, I think that much greater technical co-operation than we have at present between the two industries is necessary before electrical system space heating can obtain the success it merits.

* * *

There is also another important aspect about the association of electrical engineers with the fuel-heating industry, namely, the finer control of fuel-fired installations which can be obtained electrically, incidentally helping to get the "electrical idea" instilled into the mind of heating and ventilating men. In Harrogate recently I learnt that considerable attention is being given to providing automatic stoking for fuel-fired boilers in large buildings for space heating, steam cooking and domestic hot-water supplies. An "Underfeed" stoker with a motor-driven worm conveyor is usually applied to the boiler and the motor is switched on and off with the operation of a rheostat. The result, said Mr. A. Kelso, chief assistant, is a considerable electricity consumption, reduced stoking costs and ability to use a lower grade of coal.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electrical Quantities

THE author of the article bearing the above title in your issue of April 28th seems to me to start from unjustifiable premises and to proceed to build up analogies which are the opposite to those generally accepted.

Surely the quantity in electrical science corresponding to mechanical force is electric force, or potential gradient, so that torque corresponds to potential difference and not to current. The mechanical property corresponding to inductance is inertia, and that corresponding to capacitance, elasticity (or, rather, its reciprocal).

The solid bar he mentions corresponds, not to a perfect conductor, but to an *insulator*, which can withstand an applied p.d. after an initial "displacement current" (Faraday's term) has flowed, just as the bar can withstand an applied torque after initial torsional displacement of adjacent particles of the bar. His column of air is really a better representation of a conductor, which allows a current to flow with only a small p.d.

His concluding paragraph, purporting to show an instance in which the analogy has proved serviceable, is unfortunate. He deduces that, in a rectifier circuit containing inductance, "the rectifier might as well be perfectly conductive in both directions." This is not so—there are many thousands of such circuits in existence for the supply to radio sets, etc., and as a rule the rectifier contrives to do its job. D. W. LYALL.

Crossgates, Fife, *May 2nd.*

Electric Razors in Bathrooms

In reply to Mr. E. A. Mills, I note that the wash-boilers in question are not portable, and my comments do not, therefore, apply.

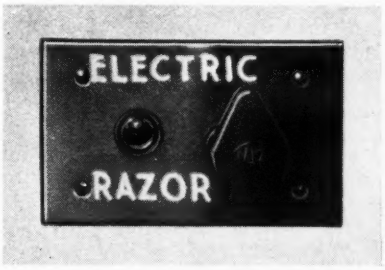
At the same time, the statement that everything is in strict accordance with the Regulations is rather difficult to follow, seeing that these Regulations forbid even an insulated pattern switch within reach of a person seated in a bath. I have always understood that by tacit agreement a water heater may be in a position where it can be touched by a person seated in a bath, but only for the reason that it is mechanically bonded to the water system, probably beyond the possibility of earthing failure.

To install a ceiling switch to control the light and then permit other apparatus to be placed alongside the bath would appear to be contrary to the spirit of the Regulations, if not the actual letter. T. C. GILBERT.

Folkestone, *May 8th.*

In view of the recent correspondence upon the possible danger of using electric razors in a bathroom I think that the accompanying photograph will interest readers.

It shows a special plug which is provided in every bedroom in a well-known Edinburgh hotel at which I stayed recently.



Provision for an electric razor in an Edinburgh hotel bedroom

This must surely be the last word in modernity and the proprietors are to be congratulated not only on their regard for their guests' convenience but also for their safety. With such a provision there is no excuse at all for using the razor in a bathroom.

The general adoption of this idea would solve the problem which this correspondence has raised. SHAVER.

May 9th.

Parliamentary News

By Our Special Reporter

Automatic Telephones

IN the House of Commons last week Mr. Day asked the Postmaster-General whether he would state the number of manual telephone exchanges in the London area, within ten miles of Oxford Circus, still to be converted to automatic working; and if he would say which of these exchanges were now due to be converted.

Major Tryon said that the number still to be converted was thirty-one. Victoria and Kingston-on-Thames Exchanges would, it was hoped, be converted this month, and Rodney, Malden and Woolwich Exchanges within the next three months. The conversion of the remaining exchanges would, in accordance with the present programme, be completed by about 1944.

L.N.E.R. Electrification

On May 3rd Mr. Trevor Cox asked what progress was being made with regard to the electrification of the London and North Eastern Railway between Manchester and Woodhead.

Capt. Wallace said he was informed by the London and North Eastern Railway Company that work on the electrification of the line was progressing satisfactorily in accordance with a programme which contemplated its completion about the end of 1940.

Supply in Stirling

Mr. Johnston asked the Minister of Transport whether he was aware that the Grampian Electricity Supply Company had a statutory monopoly for the supply of electricity to the rural and agricultural areas in West Stirlingshire; that the company had recently refused to carry its supplies into an area on the ground that guarantees had not been forthcoming for demands sufficient to meet an undefined percentage return upon its estimated capital expenditure; what was the percentage required; and what steps he was taking to see that the area in question was supplied with electricity at a reasonable rate.

Capt. Wallace said he assumed that the right hon. gentleman was referring to an extension of the Grampian Company's mains to Fintry and Newtown. He was informed that the eventual maximum gross revenue on an immediate expenditure of £2,800 was at present estimated at only £195, but that the company would be prepared to proceed if it were assured of a gross revenue of £350.

The Electricity Bill

Mr. De la Bere asked the Minister of Transport whether he could make some statement regarding the introduction of the Electricity Distribution Bill.

Captain Wallace said he could not add to what had already been said regarding the introduction of this legislation, but the reorganisation of electricity distribution was regarded as a matter of major importance with which it was intended to deal as soon as circumstances permitted.

Mr. De la Bere asked the Minister if he was aware that in July, 1937, there was a public inquiry in Evesham because the rural areas were inadequately supplied with electricity by the Shropshire, Worcestershire and Staffordshire Electricity Supply Company. Just as there was a national telephone system, could there not be a uniform rate and a uniform supply of electricity throughout the country? The present position was an "absolute scandal."

Capt. Wallace said that the Prime Minister answered that question on March 1st.

Mr. De la Bere asked if the Minister was aware that although the rural areas stood in urgent need of electricity nothing was done, owing to the persistent obstruction of vested interests.

There was no reply.

The Yarmouth Mishap

THE cause of the explosion at Great Yarmouth power station on March 20th (reported in the ELECTRICAL REVIEW of March 24th) which resulted in the death of John Smith, a turbine driver, and in the interruption of supply to Yarmouth, Lowestoft, and 250 square miles of countryside, is attributed to a rat. At the adjourned inquest on May 8th Mr. P. E. Rycroft, borough electrical engineer and manager, said that the rat got into one of the auxiliary switch cubicles and short-circuited one of the 6.6-kV terminals between paw and tail. Certain control wires had not been connected by a contactor and so the circuit-breaker did not clear the fault. A verdict of "Accidental death" was returned.

D

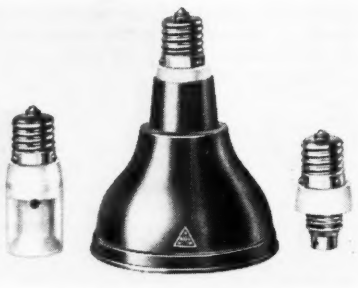
NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

A.R.P. Street Lighting Adaptors

A problem in air-raid precautions is the adaptation of high-wattage dispersive lighting fittings to provide a limited pilot effect. Quite a number could be safely used if fitted with a low-wattage lamp, but there are many types of distributing or semi-distributing high-wattage fittings which would not be suitable if they were so arranged.

ROWLANDS ELECTRICAL ACCESSORIES, LTD., have therefore introduced three A.R.P. adaptors for street-lighting fittings which completely cover the conversion of high-wattage fittings for use with low-wattage lamps. The model shown on the left is No. 985, to convert g.e.s. to porcelain-skirted b.c. adaptor. That on the right, No. 987, is provided with a brass b.c. holder with shade ring to enable a small concentrating reflector to be added in case the lighting is too distributive. The reflector unit, No. 986, is designed for use in distributive high-wattage fittings.



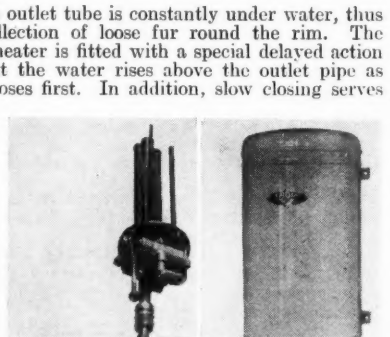
"R.E.A.L." conversion units

"Sadia" Water Heater

Last week we visited the Sadia works of AIDAS ELECTRIC, LTD., at Rowdell Road, Northolt, Middlesex, to see the company's new water heater which makes its début this week. The considerations which have led to the development of this water heater are the prevention of furring of the outlet pipe, the avoidance of drip and washer trouble generally and economy in use.

The whole of the outlet tube is constantly under water, thus preventing the collection of loose fur round the rim. The inlet valve of the heater is fitted with a special delayed action which ensures that the water rises above the outlet pipe as the outlet valve closes first. In addition, slow closing serves to prevent water hammer.

The valves themselves are spring-loaded to 30 lb., being operated by a spring-loaded plunger against a special washer and seating. The plunger itself is controlled by a sprung operating bar which is pulled forward to deliver water. The advantage of this is longer valve and washer life, as it is impossible to exert pressure on the valve beyond the strength of the spring, and a stop prevents the operating bar being forced. Economy in use is assured as the water is automatically turned off as soon as the operator releases the handle. The 1½- and 3-gal. sizes to which this new type of control is being fitted will give a top temperature output of two gallons per minute when the delivery valve is held open.



"Sadia" water heater, showing the operation of the valves

Mr. Haussauer, managing director, asserts that 60 per cent. of the maintenance calls which supply undertakings receive for water heaters is due to washer trouble, and as the valves on the new "Sadia Star" model are closed by springs always at the same pressure and in the same position, the washers are almost everlasting. If objection is taken to holding the tap open the cam on which the handle works is placed beyond dead centre so that the handle stays in the open position although it is still spring-closed. The actual movement of the valves is ½ in. for the inlet and $\frac{9}{16}$ in. for the outlet.

The design has been passed by the Metropolitan Water Board and the pressure from the incoming mains can be regulated by means of a screw. The draining plug is mounted in an accessible position below the elements.

The base assembly is interchangeable with all "Sadia" heaters of the same size, and the element is also a standard design. The containers are twice tested to 120 lb. pressure and are tinned by immersion in molten tin. They are spun from copper in two halves and welded together with copper. To ensure that the heat insulation is up to standard the containers are vibrated vigorously during the filling process so that the cork granules settle down to their ultimate level immediately.

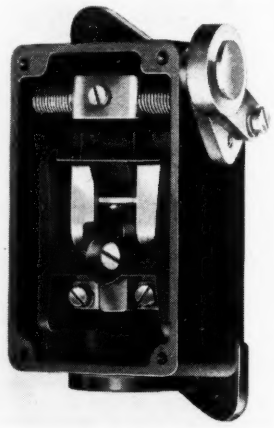
During our inspection of the water heater we were particularly impressed by the sharp cut-off of the tap which enables exceptionally small quantities of water to be drawn off.

Shunt Limit Switch

The new shunt-type limit switch of ALLEN WEST & CO., LTD., Brighton, 7, is intended for use with machinery fitted with a tappet to limit motion and for duties which do not necessitate the use of the heavier "Q1" type switch.

The slow make-and-break mechanism allows accurate setting and powerful hub springs are provided for resetting. The contacts of the "on-off" switch are self-cleaning and self-aligning with a long wipe. The AC rating is 10 A at 650 V; on DC the rating is (without a condenser) 2 A. 100/125 V, ½ A, 200/250 V and ¼ A, 400/500 V. For higher currents a condenser should be used.

Normally, an operating lever with roller is fitted, but a tappet lever can be fitted as an extra. The operating arm can be set at angles of 30 deg. through 360 deg., thus providing twelve different settings.



Allen West limit switch

By reversing the adjusting plate a further twelve settings are made available.

The switch is tapped for ¾-in. screwed conduit, an armour clamping or cone plumbing gland being available as an extra.

Emergency Lighting Set

A standard A.R.P. emergency lighting set has been developed by F. C. HEAYBERD & CO., LTD., 10, Finsbury Street, London, E.C.2, to provide a reliable and uninterrupted source of electric lighting under conditions of national emergency.

The cost of properly equipping bomb-proof shelters is in the main borne by the individuals and companies concerned, and with this in mind the "Standard" set has been designed to meet average requirements at very low capital outlay. A single set will light eight 6-V motor car side lamps at full brilliance, which is sufficient for quite a large shelter.

A double-wound transformer steps down the mains supply and the output is fed into a rectifier. The DC output thus obtained is applied across the terminals of a 6-V battery and the lighting load is also connected across the battery. The output of the rectifier can be controlled within very fine limits so that by suitable adjustments, and with the mains supply normally working, the lights are fed from the rectifier, leaving the battery in fully charged condition with a slight trickle charge passing into it. This condition is obtained in practice by adjusting the control knob to that position which sets the pointer of the clear scale ammeter slightly above zero.

Heayberd emergency lighting set

DUAL PROPAGANDA

National Service and Electricity

By J. Allen*

RECENT activities of the Bury Corporation Electricity Department, in conjunction with the organisers of the various branches of National Service in the town, have shown how campaigns, although in themselves far removed from the subject of electricity, can, with a little thought and initiative, be linked up to "kill two birds with one stone."

The Bury "Safety First" window display

In November last, as a result of a showroom window "tie-up" with a film then being shown at a local cinema, application was made by the Police Department for help in a similar manner on the question of "Safety First." After discussion it was arranged for a display to be exhibited in one of the showroom windows consisting of a map of the borough showing the number of accidents which had taken place during the previous ten months. This was supported by numerous "Safety First" posters and, of course, an electrical touch was embodied in the form of a refrigerator announcement—for "food safety."

A very important aspect of this display was the prominence which was given to it in the local Press. A photograph was reprinted on the front page in addition to an editorial account, a special news paragraph and a further general interest "story."

Although the display could in no way be considered as a selling display from the point of view of the Electricity Department, the interest which it aroused and the crowds of people which it succeeded in attracting to the electricity showrooms—as many as forty people at a time were counted viewing the windows—made its success indisputable. The photograph reproduced on this page will give some idea of the display.

According to records submitted by the police, this was the first occasion on which any similar publicity "stunt" had been arranged. Since then the Lancashire Constabulary have had a special window display model constructed depicting "Danger on the Road," and this is being exhibited in many towns in Lancashire. Apparently, the police authorities also realised the value of the "tie-up."

The most recent idea, however, which has been even more successful is that which was alluded to at the beginning of this article, *i.e.*, the "tie-up" with the various branches of National Service. The local secretary for National Service, the fire brigade superintendent, the St. John Ambulance and the adjutant of the 5th Battalion Lancashire Fusiliers of the Territorial Army were all approached and were quite enthusiastic when the proposal for a week of intensive publicity was explained to them.

It was arranged that a window display should be planned to include an appeal to the public to join any of the voluntary services advertised widely throughout the country at the present time. Figures of a Territorial, a nurse and an air-raid warden appeared in the window, together with appropriate posters. Throughout the daytime, army wagons with anti-aircraft and anti-tank guns were stationed outside the showrooms and a fire engine and an ambulance were periodically on show. Along with these vehicles, recruiting officers of the Territorials and Auxiliary Fire Service were in attendance and enlisted members of the crowd.

As I write this article in the showrooms, at the end of a week's recruiting drive, a crowd estimated at approximately 1,000 people, is assembled outside. Two Territorial Army wagons mounting guns are stationed outside and are accompanied by some ten or twelve recruiting officers who are enlisting recruits from the crowd. A fire engine with ladders extended to a height of 40 ft. is immediately in front of the showroom door. From the top of the ladder firemen are demonstrating the "Davy" life line, and the men who are being lowered from the top of the escape to the ground are causing great attraction and are likely to hold the attention of the crowd for hours.

Behind the fire engine is an ambulance fitted with loud speaker equipment and an appeal to the crowd has just been made on behalf of all National Services. At the present moment the Mayor of Bury is entering the ambulance to make a further appeal. An enrolment desk for volunteers has been placed inside the showrooms which has necessitated keeping the premises open until about 10 o'clock each evening.

It was suggested that after the appeal had been made each evening the loud speaker equipment should be utilised for a short talk on electric cooking, but it was decided that this would be rather too blatant. It was, however, arranged that the words "Electricity Showrooms" should be used over the microphone ostensibly to inform people where to enrol.

Territorials and auxiliary firemen and their equipment stationed outside the showroom

Added value from the "stunt" was obtained from the Electricity Department's point of view by the arrangement of cooking demonstrations in the demonstration theatre throughout the period of the "drive," and it is interesting to note that the attendances very definitely increased as compared with those obtained during usual demonstrations. Here, again, the amount of publicity accorded to the venture by the Press was quite considerable.

During the week prior to the commencement of operations, notices were displayed in the local paper advising readers of

* Showroom Superintendent, Bury Corporation Electricity Department.

what was to take place and that the showrooms were to be the centre of attraction. At the end of the first week the other photograph reproduced was published on the front page of the paper, together with half a column of matter. It should be recorded that this photograph was necessarily taken early in the afternoon when very few people were in the vicinity in order to obtain an unobstructed view of the vehicles and building.

And now a word with regard to the results obtained by the National Service authorities and also the results from the business point of view of the Electricity Department. In the first place, at the end of this first week a record was constituted by the enrolment of well over 300 recruits for all branches of National Service. Over 90 people enrolled during one day, which is also a record for the area. The enlistment of Territorials was singularly successful. In three days alone fifty men came forward.

The showroom business recorded during the week was exceedingly gratifying. The showroom sales for the week were 116 per cent. in excess of those of an average week and 488 per cent. above those recorded for the corresponding week last year. In addition to this, electric cooker business was approximately 120 per cent. more than on an average week and 350 per cent. more than on the corresponding week last year.

Quite apart from the actual increase in business, the value of the publicity obtained must also be taken into account. It must be realised that the activities in and around the showrooms formed the subject of much discussion amongst the general public throughout the week, and the prominence which the showrooms assumed will undoubtedly result in further business in the future. As any publicity and advertising man will appreciate, it is impossible to determine accurately the total results of any particular publicity scheme, although it is possible to judge to some extent whether the scheme has been worth while.

In the face of the figures given above, it cannot but be admitted that this form of propaganda work, if thoroughly organised, is of considerable value both to the electrical industry and the co-operating organisation.

Australian Imports

United Kingdom's Share in the Advance

ELECTRICAL imports into Australia during the financial year 1937-38 amounted in value to £4,930,000, an increase of nearly £1,000,000 compared with the previous twelve months. This improvement of nearly 25 per cent. followed one of about 20 per cent. on the 1935-36 figures, which had themselves shown an advance of 30 per cent. on those for 1934-35.

The following table, which is based on the recently issued foreign trade returns of the Commonwealth, shows the values and chief supplying countries of the principal items in 1937-38, with notes of increases or decreases compared with 1936-37. It will be seen that striking advance was made in the cable group, to the benefit of United Kingdom exporters, and that imports of motors and dynamos showed large increases. Throughout, the share of Great Britain has been well maintained. The statistics generally may well be studied in conjunction with the article on the Australian market which appeared in the ELECTRICAL REVIEW of April 21st.

	1937–38 £	Inc. or dec. on 1936–37 £
Dry cells—		
Total	3,860	− 950
From United Kingdom	2,420	− 870
,, United States	1,220	− 30
Storage batteries for radio sets—		
Total	290	+ 250
Nickel alkaline batteries—		
Total	10,500	+ 6,900
From United States	9,700	+ 7,300
Storage batteries for motor vehicles—		
Total	5,870	+ 3,710
From United Kingdom	2,680	+ 1,090
,, United States	3,030	+ 2,530
Other batteries and parts—		
Total	13,200	− 3,800
From United Kingdom	1,500	− 5,350
,, United States	11,500	+ 1,810
Cables and wire (cotton covered)—		
Total*	7,500	+ 2,320
Cable, telegraph and telephone, paper-insulated, lead-covered—		
Total	22,500	+ 15,800
From United Kingdom	15,600	+ 12,000
,, Germany	6,800	+ 3,800
Other telegraph and telephone cable—		
Total	90,000	+ 65,000
From United Kingdom	10,800	+ 25,900
,, Germany	48,800	+ 38,700
Light and power cable, paper-insulated, lead-covered—		
Total*	208,000	+ 124,700
Other cable and wire for light and power—		
Total	957,000	+ 145,000
From United Kingdom	900,000	+ 145,000
,, United States	3,300	− 6,200
,, Germany	20,000	− 100
,, Canada	3,800	+ 1,200
,, Japan	7,800	+ 1,700
Other covered cable and wire—		
Total	153,000	+ 12,000
From Germany	13,100	+ 4,800
,, United States	11,800	− 20,300
Carbon manufactures—		
Total	96,000	+ 27,700
From United Kingdom	26,900	+ 11,800
,, United States	16,400	+ 4,100
,, Germany	19,800	+ 2,600
,, Japan	1,600	− 800
Motors under 1 H.P. (separate)—		
Total	189,000	+ 89,700
From United Kingdom	83,000	+ 31,000
,, United States	18,000	+ 2,800
,, Germany	5,800	+ 1,800
Switches, fuses, cut-outs, etc.—		
Total	120,600	+ 20,600
From United Kingdom	84,800	+ 20,900
,, United States	13,100	− 5,100
H.v. induction coils—		
Total	8,600	+ 700
From United Kingdom	1,400	+ 200
,, Canada	2,900	+ 600
,, United States	4,300	+ 100
Electric fans, for office or house—		
Total	16,800	− 4,700
From United Kingdom	9,200	− 2,100
,, Italy	6,800	+ 4,800
,, United States	300	− 4,200
Circuit-breakers or switch units above 15 kV—		
Total*	182,000	+ 9,400
Reactors, voltage regulators, etc.—		
Total*	33,000	+ 15,000
Lightning arrestors other than radio—		
Total	19,100	+ 1,500
From United Kingdom	3,800	− 4,200
,, United States	12,400	+ 4,900
Liquid slip regulators, thrustors, etc.—		
Total	18,700	+ 4,100
From United Kingdom	10,300	+ 2,200
,, Germany	6,400	+ 1,700
AC induction dynamos—		
Total	185,000	+ 60,000
From United Kingdom	148,400	+ 55,000
,, United States	6,200	+ 700
,, Sweden	18,400	+ 4,800
AC variable speed, commutator type dynamos—		
Total	11,500	+ 2,700
From United Kingdom	4,800	− 800
,, United States	4,900	+ 3,000
Other AC dynamos—		
Total	76,200	+ 10,700
From United Kingdom	67,300	+ 10,200
,, Germany	1,700	− 3,600
DC traction motors—		
Total	3,100	+ 800
Motors for gearless lifts—		
Total	19,600	+ 14,400
Other DC dynamo-electric machines—		
Total	227,000	+ 62,000
From United Kingdom	161,000	+ 41,000
,, Germany	24,400	+ 3,000
,, United States	27,000	+ 13,500
Other dynamo-electric machines—		
Total	19,400	− 500
From United Kingdom	6,800	− 1,700
Alternators for turbines—		
Total*	70,700	+ 4,700
Universal current machines—		
Total*	8,700	+ 100
Convertors, motor and rotary—		
Total	5,600	− 1,200
Filament lamps, automobile—		
Total	68,200	+ 9,900
From United Kingdom	25,200	+ 6,300
,, Holland	31,600	− 2,300
Lamps, under 20 V including torch and flashlight—		
Total	34,500	+ 1,800
From United Kingdom	17,900	+ 2,800
,, Japan	2,100	− 300
,, Germany	2,700	− 1,300
,, United States	4,300	− 1,400
Gas-filled lamps, 20 V and over—		
Total	86,600	− 1,000
From United Kingdom	79,300	− 2,100
,, Holland	2,400	− 1,200
Other lamps, 20 V and over—		
Total	32,000	− 5,100
From United Kingdom	24,000	− 4,000
,, Japan	3,100	+ 700
Household appliances—		
Total	15,100	+ 900
From United Kingdom	7,100	+ 1,800
,, Canada	2,700	+ 700
,, United States	1,100	− 2,400
Heating, and cooking and domestic appliances—		
Total	62,700	+ 17,700
From United Kingdom	36,600	+ 9,000
,, United States	1,900	+ 900
,, Canada	20,000	+ 5,000
Measuring and recording instruments—		
Total	129,000	+ 300
From United Kingdom	74,400	+ 2,300
,, Switzerland	12,900	+ 2,400
,, Germany	8,400	− 1,300
,, United States	29,300	+ 1,300
Regulating and controlling apparatus—		
Total	155,100	+ 44,200
From United Kingdom	121,800	+ 46,900
,, United States	25,600	− 6,400
Rectifiers—		
Total*	30,100	+ 14,400
Static transformers under 6,000 V—		
Total*	17,500	—
Static transformers at 66,000 V—		
Total*	6,600	+ 5,600
Static transformers over 66,000 V—		
Total	24,400	− 15,700
From United Kingdom	10,700	− 11,900
,, Switzerland	10,400	− 3,600
Telegraph instruments and appliances—		
Total*	6,900	− 4,500
Telephones—		
Total	51,700	+ 3,700
From United Kingdom	40,900	+ 2,200
,, Germany	4,500	+ 2,900
Telephone switchboards and appliances—		
Total	832,000	+ 341,000
From United Kingdom	728,000	+ 333,000
,, United States	83,000	− 4,200
Electric vacuum tubes—		
Total	8,900	− 5,800
From United Kingdom	1,900	− 300
,, Holland	400	− 3,900
,, United States	5,600	− 1,800
Radio tubes—		
Total	159,000	− 111,000
From United Kingdom	67,100	− 44,900
,, Holland	33,200	− 47,800
,, United States	49,200	− 20,800
Battery eliminators—		
Total	3,000	+ 1,000
Radio parts—		
Total	93,400	+ 31,700
From United Kingdom	40,100	+ 11,600
,, United States	32,200	+ 7,100
Radio receivers—		
Total	20,600	+ 7,400
Electrical appliances, n.e.s.—		
Total	212,000	+ 15,000
From United Kingdom	126,000	+ 5,000
,, Canada	1,700	− 1,700
,, Germany	15,400	+ 9,900
,, United States	57,800	− 1,400
,, Japan	2,400	− 600
Electrical ware of earthenware, including insulators—		
Total	29,800	+ 2,300
From United Kingdom	10,200	+ 400
,, Germany	7,000	+ 2,200
,, Japan	4,100	+ 1,300
Electrical insulating paper and boards—		
Total	61,800	+ 30,000
From United Kingdom	51,600	+ 25,600
,, United States	4,100	+ 1,300

* Mainly from United Kingdom.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

AT a recent meeting of West Bromwich Town Council it was agreed to place on record the Council's sincere appreciation of the long and devoted service of **Mr. W. A. Jackson,** who has retired on superannuation from the position of borough electrical engineer and manager, which he had held since 1905. The resolution is to be engrossed on vellum and presented to Mr. Jackson with best wishes for a long and happy retirement. Mr. Jackson has been presented with a camera by the staff of the Electricity Department.

Mr. C. B. Kingsford, whose appointment as manager of switchgear sales department, Willesden, of the British Thomson-Houston Co., Ltd., in succession to the late Mr. G. E. Riley, was announced in our last issue, joined the B.T.H. Co. in 1902. From 1903 to 1938 he was in charge of construction work at the Lancashire Electric Power Co.'s power station

Russell Hogarth
Mr. L. Drucquer

Elliott & Fry
Mr. C. B. Kingsford

at Radcliffe, after which he was appointed to the contract department at Rugby, where he remained until he transferred with the switchgear sales department to Willesden works in 1927. He saw war service in France from 1916 to 1918, attaining the rank of Captain (R.E.). **Mr. L. Drucquer,** of the same department, who has been appointed assistant manager, joined the B.T.H. Co., in 1920, and after some years in the test department was made responsible for the erection of the first automatic rotary sub-station on the Underground Railway. In 1925 he was appointed to contract department, and transferred to Willesden works in 1927.

Mr. C. March, A.M.I.E.E., has been appointed deputy chief engineer in the Borough of Hornsey Electricity Department. He was apprenticed to the late Mr. A. R. Sillar, M.I.E.E., M.I.Mech.E., borough electrical engineer of Colchester, and to his successor, Mr. W. Frisby, A.M.I.E.E. In 1913, on completion of his apprenticeship, Mr. March was appointed switchboard attendant and relief shift charge engineer, and in the following year he was appointed assistant mains engineer at Stoke-on-Trent, under Mr. C. H. Yeaman. While at Stoke-on-Trent he acted temporarily as shift charge engineer at the Burslem and Hanley generating stations and also at the then new central power house, now a selected station operated by the C.E.B. In the autumn of 1919 he became assistant mains engineer at Hornsey, with the late Mr. N. Staniland, M.I.E.E., and six months later succeeded the mains and consumers' engineer upon his resignation to take up an appointment in Calcutta. Mr. March was given control of the Hornsey undertaking temporarily when Mr. Staniland died in 1935, and shortly after the present chief engineer and manager, Mr. F. C. Orchard, A.M.I.E.E., took up his appointment in December, 1935, became his chief technical assistant.

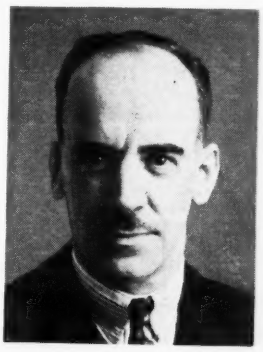
[Elliott & Fry
Mr. C. March

The annual golf competition organised by the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers in aid of the benevolent fund of the Institution, was held on May 4th on the course of the West Lancashire Club, at Blundellsands. There was a large number of entries from the Liverpool district as well as from Manchester, Birmingham and London. In the singles (against bogey), Mr. F. W. Leake (Wilmslow) was the winner of the H. P. Dennis trophy for the best score put in by a member of the Institution, while Mr. F. A. Leonard won the first prize in this event. The first and second prizes awarded on the medal play scores in the same round to players with handicaps of 13 or under went to Messrs. F. C. Briant and F. W. Leake. The first and second prizes for players with handicaps of 14 and over were awarded to Messrs. F. A. Leonard and W. H. McFadzean. A four-ball competition was played in the afternoon and Mr. W. J. Thomas with Mr. H. Nielson took the first prize and Messrs. A. Hallam and E. Platt the second. The first and second prizes for the putting competition were won by Messrs. H. R. S. Preston and J. E. Allan. A pleasant day was brought to a close by dinner at the club house when **Mr. E. L. Morland,** chairman of the Centre, presided and presented the prizes to the successful competitors.

Presentations were made on May 5th on behalf of the Derby Electricity Committee and chief officials of the Corporation to **Mr. F. Nicholls,** who has been borough electrical engineer for the past nine years. Mr. Nicholls has been appointed city electrical engineer at Leeds, and is succeeded at Derby by **Mr. F. H. Pooles,** who was formerly deputy borough electrical engineer. The presentation took place at the Electricity Hall, Irongate, and was made by the Mayor (Ald. D. S. Butler). It took the form of an illuminated scroll signed by members of the Committee and bearing as an inscription a minute passed by the Committee recording its appreciation of Mr. Nicholl's work in Derby.

Mr. D. C. Thomson, B.Sc., A.M.I.E.E., deputy borough electrical engineer of Finchley, has been appointed electrical engineer and manager to the Walton and Weybridge Urban District Council. Before going to Finchley Mr. Thomson was engaged as an engineer on the staff of W. T. Henley's Telegraph Works Co., Ltd., for eleven years and had previously held appointments in Great Britain and India. He was also associated with Kennedy & Donkin, consulting engineers, for a short period.

Mr. T. Clegg, consumers' assistant in Rochdale Corporation Electricity Department, in whose service he had been for thirty-four years, has retired on superannuation. He has been presented with an electric chiming clock and a number of books from the staff of the Department. Mr. F. H. Rudd the electrical engineer and manager, made the presentation.



[Elec. Rev. photo.
Mr. D. C. Thompson

Mr. H. L. Kirby Johnson, managing director of the Martindale Electric Co., Ltd., sailed for the United States on the *Aquitania* on Wednesday for a business trip during which he will visit the World's Fair.

Capt. J. M. Donaldson, general manager of the North Metropolitan Electric Power Supply Co., was re-elected president of the Association of Officers and Staff Members of Electricity (Power and Supply) Companies of Great Britain at the Association's annual meeting held on April 26th. Owing to pressure of business Mr. H. S. Mayer has retired from the secretaryship of the Association and Mr. E. J. Gibbons has been elected to succeed him.

Mr. W. L. Mann, of Reuters' parliamentary staff, and formerly of the *Yorkshire Post*, has been appointed public relations officer to the Yorkshire Electric Power Co. and its associated companies.

Sir Alexander Gibb, G.B.E., C.B., LL.D. (Edin.), F.R.S., was re-elected president of the London Chamber of Commerce for the ensuing year at the annual meeting held on May 4th.

Mr. W. J. U. Woolcock, C.M.G., C.B.E., a vice-president of the Federation of British Industries, has accepted the position of chairman of the Overseas Industrial Publicity Committee recently appointed by the Federation to assist in the promotion of news of British industrial enterprise in the world's Press.

Mr. F. V. L. Mathias, as we have already reported, is retiring shortly from the position of borough electrical engineer at Warrington, and the Corporation, on May 2nd, confirmed a resolution of the Electricity and Transport Committee placing on record their appreciation of his long and valuable services. Councillor J. C. Bardsley, chairman of the Committee, said that the many appointments which Mr. Mathias had held on organisations connected with the electrical industry showed that his services were appreciated not only in Warrington but in other parts of the country.

IN THE COURTS

Apprentice Awarded Damages

LORD RUSSELL, in the Court of Session, Edinburgh, awarded £175 damages in an action by James Ramsay, apprentice electrician, Edinburgh, who sued Alex. Mather & Son, Ltd., Edinburgh, for £250 as damages for personal injuries.

The accident occurred while Ramsay was employed with the firm of Pratt Brothers (Edinburgh), Ltd., who had been instructed by the respondents to carry out certain electrical work at the latter's engineering shop in Dalry Road. Ramsay and a foreman were sent to do this work, which included wiring in connection with an electric motor being installed in respondents' premises. In the course of carrying out the wiring, Lord Russell said, plaintiff ascended on to a gantry, about 14 ft. above the floor level of the engineering shop, upon which two travelling cranes were erected. While the plaintiff was engaged on this gantry one of the cranes was set in motion by an employee of the respondents. It struck the plaintiff and injured his right knee.

Plaintiff claimed that the accident was occasioned solely by the negligence of the respondents in respect of their failure to discharge the duty of protecting him from danger arising from operations which were going on in the shop while he was at work.

Respondents denied that they failed in any duty to plaintiff and pleaded that Ramsay contributed materially to the accident by his failure to take reasonable steps to protect himself.

Having dealt with the evidence his Lordship said the respondents could have specifically warned the plaintiff of the risk or brought it to his notice; or alternatively, they could have taken steps to prevent the crane from moving into the area in which the plaintiff was working. They did neither of those things. In his opinion their failure so to act was in breach of the duty which they owed to the plaintiff and was the direct cause of the accident. Dealing with the question of contributory negligence Lord Russell said that the onus of establishing that this contention was reasonably supported by the evidence rested on the respondents. In his Lordship's opinion, they had failed to discharge that onus.

False Pretences Charge

At the Stratford Police Court recently John M. Reade was charged on three counts with obtaining money by false pretences and, with intent to defraud, clocks and other articles the property of Britannia Distributors, Ltd.

It was stated for the prosecution that the defendant had ordered a number of articles from the company and upon being asked for trade references provided two which, it was alleged, were false, one actually being signed by the defendant himself and one by a former associate. Articles valued at £90 had been received by Reade who had never settled the account.

In evidence the defendant said that he had no intention of defrauding the company. He had offered to pay half the money owing but his offer had been refused. He was unable to make full payment although if he were given time he would settle the amount due. He admitted that he had disposed of the goods at less than the list prices, but denied that the references were made out and signed by himself.

The Bench found the defendant guilty and imposed a sentence of two months' imprisonment on each charge. Reade announced his intention of appealing against the sentence.

Factory Act Offences

Before Sheriff Laing at Kilmarnock last week, Southhook Potteries, Ltd., sanitary ware manufacturers, Kilmarnock, pleaded guilty to two contraventions of regulations made under the Factory and Workshop Acts in that a certain pendant screw cap lighting fitting in their factory was not installed, protected and maintained so as to prevent danger so far as was reasonably practicable, and in that they placed a single-pole switch, other than a link for testing purposes or a switch for use in controlling a generator, in a conductor, such conductor being connected to earth and being in use for supplying the lighting system.

Miss G. M. Mitchell, district inspector of factories, stated that following an accident in December it was observed that certain lighting fittings did not comply with the regulations. In order to prevent danger the screw cap fitting ought to have been protected by an insulated skirt. In connection with the second charge, through the wiring being faulty, the switch and fittings were live even when the switch was off.

An agent stated on behalf of defendants that they employed a whole-time electrician, and could not supervise every alteration that was made. There was a change-over when an extension was opened and the wires had become crossed, causing a short-circuit. The installation was in order until this change-over was made.

The Sheriff imposed on the first charge a fine of £2 and on the second charge a fine of £3, and also ordered the company to pay 10s. expenses.

Winding-up Order

In the Companies' Court on May 8th Mr. Justice Crossman had before him a petition by the General Electric Co., Ltd., for the compulsory winding-up of the Great Eastern Electric Co., Ltd., Houndsditch, E.C.

Mr. Landon said this was a creditor's petition for £378 and there was a supporting petition for £86. There had been a members' voluntary winding up but the company was quite insolvent. During the voluntary liquidation 10s. in the £ had been paid.

Counsel for the company said that since the voluntary liquidation it had been found that the company was insolvent. The petition was not now opposed.

His Lordship made the usual compulsory order.

Technical College Organisation

AN instructive account of the organisation, administration and staffing of the technical college and its varied character and functions as determined by the industries and commerce in the districts served, is given in "The Technical College," by W. A. Richardson (pp. 495; price 14s.), published by the Oxford University Press, Amen House, Warwick Square, E.C.4. The author traces the development of technical education from the Middle Ages and shows how the technical college, known officially as the College for Further Education, betrays its many-sided origin in mechanics' institutes, science and art schools, night schools, &c. He lists 144 of these colleges, in addition to which there are 191 art schools, 66 technical institutes, 162 evening institutes, 175 junior technical schools and 4,500 smaller evening institutes. The net annual expenditure on further education, *i.e.*, beyond school-leaving age, is £5 million for England and Wales, and the number of people taking such education about 1¼ millions per year. Considerable space is devoted to institutions, other than the technical colleges, and some interesting views are given on the failure in purpose of the junior technical schools.

It is shown that the work of the technical college is mostly evening work, for practically 85 per cent. of its students are evening students; 5 per cent. full-time day students and 10 per cent. part-time day students. Organisation, administration, registration and finance occupy a large part of the book. Much of this matter must be familiar to anyone interested in technical colleges, and might well be omitted.

The need, under present conditions, of cultivating warm relations with industry is emphasised. The value of the chapters on buildings and equipment and costs is doubtful, for they seem to give a catalogue of bare requirements, and one looks in vain for descriptions of well-equipped laboratories.

There is an interesting chapter on technical education in France, Germany, Belgium and the United States, and a further chapter on the problems and future of further education, in which the author gives very sound and wise judgments on the shortcomings of our system. He would like continued compulsory education until the age of eighteen instead of voluntary attendance (which results in the technical college being only a night school) and cites the success of Rugby Day Continuation School.

The author says we must look to the Continent for inspiration and ideas. One wonders why this should be necessary. Nevertheless, complete overhaul of our whole chaotic educational system is called for. What seems to be wanted is compulsory and free education in primary and secondary schools till the age of sixteen for pupils sufficiently intelligent to profit by it. The universities should devote themselves to fundamental subjects and divest themselves of applied science courses, to which the technical colleges should be devoted entirely, having been relieved of work which ought to be done in trade schools. They might well be raised to the rank of universities of applied science, and evening classes would be abolished in them. Trade and vocational schools should deal with the requirements of craftsmen and should be planned on up-to-date lines. Three years' training in fundamental subjects in the university, followed by two years' training in the technical colleges would be the ideal training for the senior posts in industry.

H. V.

Power Engineers' Conditions

AT a recent meeting of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) a number of amendments were made in the principal schedule. These relate to the granting of annual holidays and arrangements for working on Bank Holidays; insurance benefit; and adjustment of salaries in certain conditions.

COMMERCIAL AND INDUSTRIAL NEWS

The Halifax Appointment. New H.M.V. Showrooms. Radiolympia. Industrial and Commercial Lighting Installations. New B.I.F. Poster. Registered Electrical Contractors.

Halifax "Chief's" Salary

FURTHER discussion upon the salary to be offered for the vacant post of electrical engineer took place at last week's meeting of the Halifax Town Council. According to the *Yorkshire Observer*, when a salary of £1,100 was offered and the position was "banned" by the A.M.E.E. and the I.E.P.E.A. only fourteen applications were received. Two applicants were selected for interview, but only one attended and he was found unsuitable. The Light, Heat & Power Committee therefore proposed that the post should be readvertised at a salary of £1,300. After debate an amendment was carried that the minute should be withdrawn and that the matter should be considered again in six months' time. During the discussion it was maintained by some speakers that the "Electrical Managers' Association" was endeavouring to dictate to Councils what salaries should be paid to electrical engineers. One speaker said that they had been told that they would require a "super-genius" to run the new plant at the power station "but the manufacturers guaranteed its running for twelve months." Alderman J. H. Waddington, chairman of the Committee, said that it would be unwise to defer the appointment as the acting engineer had taken on the responsibility against his wishes at his (the chairman's) personal request. The action of the engineers' associations had not influenced the Committee one iota; in his considered judgment the post was worth £1,300.

Wear and Tear of Generating Plant

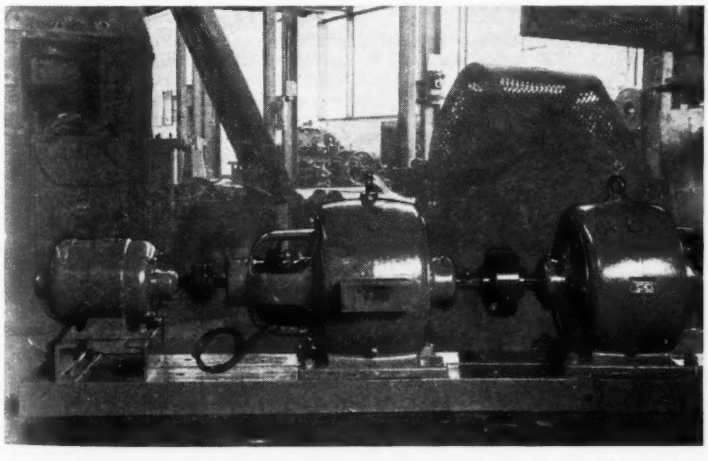
We reported in our issue of March 10th (p. 365) that the Inland Revenue Department had agreed to increase the rate of allowance in respect of wear and tear of generating plant at selected stations from 5 to 6¼ per cent. The May *I.M.E.A. Journal* points out that in the case of a non-selected station the generating plant and machinery will normally be granted an allowance at the same rate but as regards stations operated for short periods only each case will be dealt with on its merits. In a recent decision (now the subject of appeal) the Special Commissioners declined to grant any allowance in respect of wear and tear in the cases of Woking and Reigate.

Zinc Development Association

The Zinc Development Association was registered on May 4th as a company limited by guarantee without share capital. The original number of members is twenty, and each member is liable for £5 in the event of winding up. The word "Limited" is omitted from the title by licence of the Board of Trade. The objects are to acquire the assets, liabilities and business of the Zinc Development Association, Ltd., and to promote the increase in the consumption of zinc, &c. The subscribers are: Imperial Smelting Association, Ltd., London Zinc Mills, Ltd., National Smelting Co., Ltd., Electrolytic Zinc of Australia, Ltd., Burma Corporation, Ltd., Trepca Mines, Ltd., and Amalgamated Metal Corporation, Ltd. The management is vested in a Council, the first members of which are to be appointed by the subscribers. The solicitor is J. W. Nicholson, 95, Gresham Street, E.C.2.

South African Municipal Year Book

The 1938-39 edition of the "Official South African Municipal Year Book," which is now available, is in similar form to previous editions. With the growth of engineering and electrical engineering enterprise in South Africa the particulars are much more extensive than those published previously. Data relating to municipalities and local bodies has been revised and the comparative statistics of finance, population, tramway undertakings, water supply, electric lighting, transport, &c., are dealt with in such a manner as to make the volume a comprehensive work of reference. The book is published at 25s. and can be obtained from the London agents, E. G. Allen & Son, Ltd., 12 and 14, Grape Street, London, W.C.2.



H.M.V.'s New Premises

For nearly twenty years 363, Oxford Street, London, has been a centre of H.M.V. activities. Following the disastrous fire in December, 1937, Mr. Joseph Emberton undertook the design of a new building on the same site, and on Monday last Sir Thomas Beecham officially opened the company's new administrative offices, including sales headquarters for household appliances, spacious showrooms and a demonstration kitchen. The exterior is of modern aspect, with a façade of black granite and glass bricks over a large arcade pattern window.

A part of the household appliances showroom at the new H.M.V. premises

The interior is handsomely appointed, bright and airy. In addition to a system of Carrier air-conditioning throughout, each room is independently heated by thermostatically controlled H.M.V. mushroom-like convection heaters. An unusually large number of lighting fittings of various patterns has been installed, the radio and television showroom on the first floor having an interesting combination of indirect and projector fittings, obviating glare. A staircase of modern design provides access to the household appliances showroom in the basement, with an adjoining model kitchen planned to minimise work. Demonstrations of the various domestic appliances will be given from time to time.

An Interesting Conversion Unit

Calling on J. Gerber & Co., Ltd., at Wembley last week we saw an unusual set that had been built up for the Central Electricity Board at Leeds for meter testing. The requirements were a 200-V, single-phase motor to drive a 120-V, three-phase alternator which would run at constant frequency. As two similar DC motors were available one was converted to a 200-V synchronous commutator motor, the commutator being turned down level, micanite put on the top and rings turned down and shrunk on.

The motor was self excited and excited also the alternator. It was found that this arrangement prevented "hunting" which was experienced with separate excitation for each machine. The alternator was a conversion from a similar DC machine redesigned to give 1.6 kVA at 120 V, three phase, 50 cycles. A ¾-HP repulsion induction motor, speeded up to 1,600 RPM for synchronising, served as a starting motor and was directly coupled to the commutator end of the synchronous motor. The whole set was mounted on a common bedplate.

The Gerber conversion unit

Radiolympia, 1939

Plans are now in active preparation for this year's Radiolympia, which will be held from August 23rd to September 2nd, and the Radio Manufacturers' Association has sent us a booklet which gives a complete picture of what the exhibition will be like. Among the many features will be a large-scale model of the Alexandra

Palace television tower, which will act not only as a decorative feature but will also house the main amplifier for the television and sound programmes to the stands and provide direct access to the cinema hall and tea garden in the gallery.

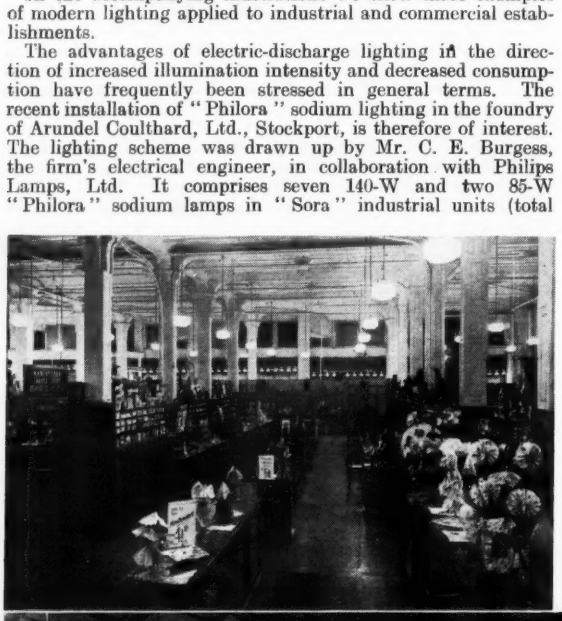
E.I.B.A. Rules

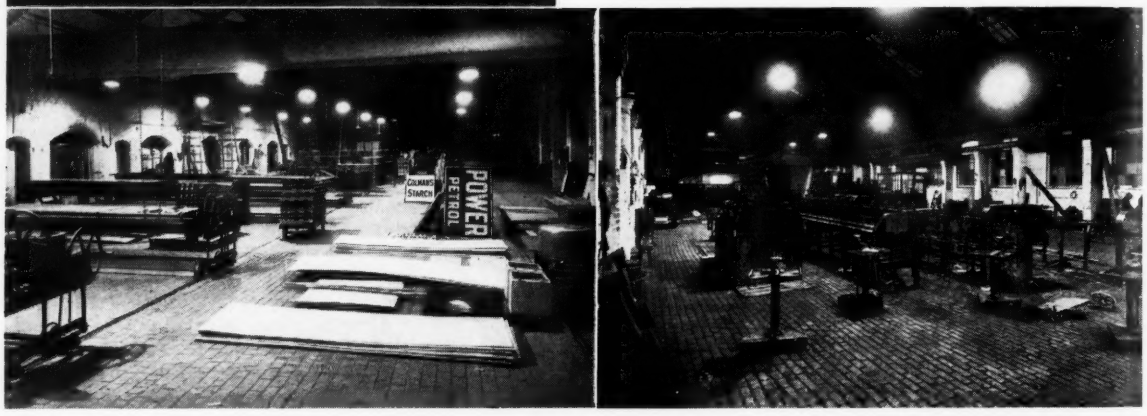
The extraordinary general meeting of the Electrical Industries Benevolent Association which was to have been held on April 21st but was postponed is to take place on June 15th at the offices of the Association. A resolution is to be submitted making certain amendments in the rules relating to quorums at meetings and the accounts.

Modern Lighting Installations

In the accompanying illustrations we show three examples of modern lighting applied to industrial and commercial establishments.

The advantages of electric-discharge lighting in the direction of increased illumination intensity and decreased consumption have frequently been stressed in general terms. The recent installation of "Philora" sodium lighting in the foundry of Arundel Coulthard, Ltd., Stockport, is therefore of interest. The lighting scheme was drawn up by Mr. C. E. Burgess, the firm's electrical engineer, in collaboration with Philips Lamps, Ltd. It comprises seven 140-W and two 85-W "Philora" sodium lamps in "Sora" industrial units (total





Three interesting lighting installations, showing (top) fittings supplied by the British G.E.C. in a New Zealand store, (left) Rowlands reflectors in the premises of the Patent Enamel Co. and (right) a "Philora" sodium lighting installation in a foundry

1,150 W), replacing twelve 500-W gas-filled lamps (total 6,000 W).

The gain in illumination intensity is as striking as the reduction in the lighting load—8 ft.-candles compared with only 2 ft.-candles under the previous lighting. The success of the new scheme in the foundry decided the company to continue it throughout the mechanical assembly shop, which was accordingly equipped with eight 140-W and two 85-W sodium lamps, also in "Sora" reflectors (total load 1,290 W) in place of fourteen 500-W gas-filled lamps (total load 7,000 W). Here the illumination intensity on the working plane rose from 5 to 10 ft.-candles.

An interesting example of the effective use of efficient reflectors for workshop lighting is that of a recent installation at the premises of the Patent Enamel Co., of Selly Oak, Birmingham. Here the installation was carried out with reflectors manufactured by Rowlands Electrical Accessories, Ltd. (list No. 712 type). These are mounted at a height of 10 ft. and equipped with 200-W lamps. The average intensity on the working plane is 9-10 ft.-candles.

The third example is a store lighting installation which was recently carried out at the premises of John Courts, Ltd., one of the largest stores in Auckland, New Zealand. The building has six storeys in addition to the basement, and the lighting scheme involves nearly 400 totally enclosed fittings in the various departments, a large number of smaller fittings on landings and passages and a decorative lighting scheme in the tea-room. The lighting was designed by Mr. S. E. Kennings with the co-operation of the Auckland branch of the British General Electric Co., Ltd., who supplied the fittings.

The totally enclosed fittings are of opal glassware. Most of these are pendants with chain suspension, but in the basement, where a considerably lower mounting height is inevitable, similar fittings are fixed flush with the ceiling. The landings and corridors are lighted by smaller fittings of similar design. The success of this part of the scheme induced the company to consider re-lighting the tea-room on the top floor. This was contrived with thirty decorative fittings of chromium and champagne-tinted glassware, and twelve brackets to match, the ceiling fittings being equipped with 150-W "Osram" lamps.

Electricity Supply Staff Association

The annual general meeting of the Association of Officers and Staff Members of Electricity (Power and Supply) Companies of Great Britain was held at Caxton Hall, Westminster, on April 26th. The chair was taken by the president, Capt. J. M. Donaldson, who referred to the fact that the members of the Association by their support and the Executive Committee by its work were benefiting to a great extent many persons outside who should themselves support the Association by becoming members. He felt that those engaged in the industry did not realise what was being done for them by the Association, and accordingly greater advertisement of its aims and objects was desirable. The Association by its constant watch on proposed public and private legislation to see that the status and existing rights of members of the industry were preserved was performing a task which should receive their support. He suggested that the Committee might consider the advisability of raising the subscription in order to increase the financial resources of the Association.

Radio Manufacture in Lithuania

The question of manufacturing radio sets in Lithuania has recently been discussed, learns *Reuter's Trade Service*. It seems that such an enterprise would have excellent prospects because at present Lithuania imports several thousand of sets every year. When the proposed new radio station is built the number of listeners, especially in the rural districts, will undoubtedly increase, and this will involve the expenditure abroad of still larger amounts of currency. On the other hand, the manufacture of ordinary receivers is not a complicated process and is well within the competence of local specialists, and expensive equipment is not necessary. Valves and certain other parts would be imported. The participants in a conference on the matter favoured in principle the establishment of a large concern in the form of a joint-stock company with State capital, but without excluding private initiative and without granting monopoly rights to anybody. Several Lithuanian concerns have already expressed the wish to undertake the manufacture of radio sets.

Lighting Information

Our attention has been drawn to a lighting information service established by Mr. H. L. Juliusburger, 25, Victoria Street, S.W.1. It takes the form of periodical bulletins containing classified references to technical and commercial developments in the lighting field which have appeared in British and foreign publications and a wide range is covered.

Use of Substitute Materials

An example of the extent to which substitutes are being used in the German electrical industry is the wire and cable branch in which hardly a single raw material of a few years ago is still used. Aluminium has taken the place of copper for the conductors, cotton wrapping has been replaced by cellulose wool, silk insulation by rayon, and rubber is now being replaced by buna (artificial rubber). The first buna insulated cables have recently been exported to Manchukuo.

and it is expected that by the middle of the year all or nearly all wire and cable exported will have buna insulation in the place of rubber. The use of artificial plastics, notably for insulation, has developed very considerably, and the German electrical industry is now using an ever increasing quantity of these materials. It is estimated that about one-fifth of the plants for the production of plastics are in the hands of electrical manufacturers.

Registered Electrical Contractors

The annual meeting of the National Register of Electrical Installation Contractors is being held to-day (Friday) at 3.30 p.m. at the Institution of Electrical Engineers. The agenda includes the consideration of amendments to rules proposed by the Executive Committee. The recommendations are that Rule 4 (B) shall be amended to permit county councils and other local authorities having electrical contracting departments to apply for registration; and that Rule 7 shall be amended to allow the National Register to retain the whole of the registration fee of £5 5s. in the event of an application being refused or withdrawn and to abolish the issue of duplicate certificates.

The accounts show that the income for 1938 rose from £4,312 to £4,409, while the expenditure decreased from £4,304 to £4,161, raising the surplus carried to the balance sheet from £8 to £248. (The 1937 accounts carried an item "solicitors' fee £193.") The principal increase in income was from the issue of certificates, the amount being about £82 higher; income from renewal fees and the issue of duplicate certificates remained on about the same level.

French Imports and Exports

French imports and exports of electrical machinery, apparatus and cognate material during 1938 as compared with 1937 are shown in the appended table. The values are given in thousands of francs, while, for purposes of comparison, the sterling value of the totals converted at the current franc value of 176¾ fr. to the £ has been added. It will be seen that the past year's imports show an increase of £190,031 and the exports an advance of £856,590.

	Imports		Exports	
	1937	1938	1937	1938
	1,000 Francs.		1,000 Francs.	
Dynamo-electric machines, transformers and parts ...	52,042	68,561	32,527	72,963
Telegraphic, telephonic and other elec. apparatus ...	193,912	208,430	99,257	159,555
Incandescent lamps and radio valves	77,570	74,740	20,126	19,335
Arc lamps and parts... ...	392	264	66	366
Carbons for electrical and industrial purposes ...	8,816	11,147	23,848	31,851
Electric wires and cables ...	10,686	8,436	45,987	64,089
Parts of electrical apparatus	28,034	39,352	18,865	32,820
Magnets, other than electro-magnets	951	1,600	—	—
Accumulators and parts ...	2,092	1,166	15,337	22,250
Dry batteries and condensers	14,898	9,829	4,168	6,197
Porcelain and other insulators	2,789	2,244	11,899	14,056
Total Fr.	392,182,000	425,769,000	272,080,000	423,482,000
Total at 176¾ Fr. to £	£2,218,852	£2,408,883	£1,539,350	£2,395,940

London School of Domestic Science

The annual one-week refresher course held by the London School of Electrical Domestic Science will commence on July 24th. The course is especially designed for demonstrators in the electrical industry and for domestic science mistresses. Particulars can be obtained from the School at Imperial Court, 2, Basil Street, Knightsbridge, London, S.W.3.

"Tin and Its Uses"

In the first number of a new quarterly review just published under the above title by the International Tin Research and Development Council there appears a description of the Council's laboratories and offices at Greenford, Middlesex. An article on the tinplate and canning industries reviews major changes in methods of production, and the application of modern plant for the cold reduction of steel and the continuous tinning of wide strip. One of the principal objects of the new publication, which is intended primarily for consumers of tin and tinplate, is to summarise the results of technical researches on tin, with special reference to their application to industry. Copies may be had free of charge upon application to the Council, Fraser Road, Greenford, Middx.

Price Reduction

Elliott Brothers (London), Ltd., announce that the price of their "Weameter" test set has been reduced.

Trade Announcements

Lead Pipes, Ltd., has opened an office in London at 32, Queen Victoria Street, E.C.4 (telephone: City 4647).

The Westinghouse Brake & Signal Co., Ltd., informs us that its northern representative for metal rectifiers, Mr. W. E. Wilkins, has changed his address to Agden Lane Farm, Agden, Lymm, Warrington. (Telephone: Lymm 516.)

The Hull branch of the General Electric Co., Ltd., is removing on May 15th to Magnet House, 83 and 84, Wright Street, Hull. The new premises will provide increased accommodation in the showrooms, offices and stockrooms. The showrooms will display all types of lighting fittings and household appliances in appropriate surroundings.

Silver Jubilee of the B.I.F.

The British Industries Fair reaches its silver jubilee next year and the event is celebrated by the appearance of the dates "1915-1940" in the new poster which is already in the hands of the printers, although the Fair does not open in London and Birmingham until February 19th, 1940. The poster is in red, white and blue. It will be seen that the figure of Britannia is no longer included in the picture. The "Key of Opportunity" is now the Fair's emblem, with Britannia's trident incorporated in the design. The letterpress will be translated into eight languages for display in eighty countries all over the world.

The new B.I.F. poster

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price May 10th	Fortnight's inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¾d.	—
c ,, Wire, basis ... ... ,,	8¼d.	—
c Copper Tubes (solid drawn) ... ,,	1/0¾d.	—
g ,, Bars (best selected) ... per ton	£78	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars... ... ,,	£48 15s.	10s. inc.
d ,, ,, Wire Rods ... ,,	£53 10s.	10s. inc.
d ,, ,, H.C. Wire ... per lb.	7¾d.	¼d. inc.
f Ebonite Rod ⅛" dia. & up. ... ,,	1/10 to 2/5	—
f ,, Sheet 1/16" thick & up. ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	7¼d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 15s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£16 10s.	5s. inc.
g Mercury ... ... per bot.	£17 15s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1d.	—
p ,, ,, rolled strip & sheet ,,	11¼d.	—
p ,, ,, wire ... ... ,,	1/1⅜d.	—
o Platinum ... ... per oz.	£7 10s.	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	¼d. inc.
g Spelter ... ... per ton	£13 12s. 6d.	1s. 3d. inc.
g Tin, Block (English) ... ... ,,	£224 15s.	£1 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

It should be noted that prices quoted for copper do not include any allowance for insurance against war risks.

New Catalogues and Lists

Silvertown Lubricants, Ltd., Minoco Wharf, West Silvertown, London, E.16.—A folder containing booklets dealing with transformer and switch oils, heavy insulating oils and cable oils and compounds, together with hints on care and maintenance in service.

Keith Blackman, Ltd., Mill Mead Road, Ferry Lane, Tottenham, London, N.17.—A folder on A.R.P. fan units.

Simplex Electric Co., Ltd., Broadwell Road, Oldbury, Birmingham.—A 48-page illustrated catalogue of lighting units, including industrial and watertight units.

Veritys, Ltd., Aston, Birmingham.—A booklet describing, with full technical details and constructional illustrations, the range of "Propelair" fans.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—Leaflet No. 146 relating to "Cantie" type STF distribution gear.

Time Switches & Instruments, Ltd., 120, Victoria Street, London, S.W.1.—A leaflet describing a short-period staircase time-switch.

British Timken, Ltd., Cheston Road, Aston, Birmingham, 7.—The first issue of "Timken Times."

Unbreakable Pulley & Millgearing Co., Ltd., Wakefield.—A 36-page catalogue of power transmission equipment.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A catalogue of poison gas filtration plant and air-raid shelters.

Gramophone Co., 363, Oxford Street, London, W.1.—A large broadsheet describing and illustrating H.M.V. "Economy" washers.

Electro-Horticultural Co., Ltd., Harpenden, Herts.—Leaflets relating to soil sterilisers, greenhouse heaters, propagating frames, conversion heaters, thermostats and general low temperature heating for greenhouses.

Ransomes & Rapier, Ltd., Waterside Iron Works, Ipswich.—A leaflet dealing with a "Rapier" mobile magnet crane.

Batwin Electric Motors, Ltd., 138, Southwark Street, London, S.E.1.—A complete catalogue of electric motors.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—New pamphlets on air-break switches, plugs, time lag relays, welding equipment, water heaters and steam raisers, and a booklet "Useful Notes on Fuses."

Hydraulic Coupling & Engineering Co., Ltd., Fluidrive Works, Worton Road, Isleworth, Middx.—A booklet of 26 pages on fluid couplings.

Wego Condenser Co. Ltd., Bideford Avenue, Perivale.—A catalogue of paper dielectric condensers.

Private Arrangements

F. McCarley, trading as Mac's Radio Service, late Market Hall, Eccles.—The creditors were called together recently, when a statement of affairs was submitted showing liabilities totalling £1,272, all due to unsecured creditors. The net assets were £423, leaving a deficiency of £849. It was decided that the debtor should be requested to execute a deed of assignment to Mr. F. E. Bendall, of Poppleton & Appleby, Manchester, as trustee. A committee was also appointed.

H. Eastwood, 539, Selby Road, Leeds, radio and electrical engineer.—The creditors met recently, when Charles H. Baker & Co., of York House, Alfred Street, Leeds, submitted a statement of affairs showing ranking liabilities of £399 and in addition there were fully secured creditors for £572. The net assets were £111, leaving a deficiency of £288. The creditors passed a resolution in favour of the estate being dealt with under a deed of assignment to Mr. C. H. Baker as trustee.

Bankruptcy Proceedings

F. W. Chattaway and **J. A. London,** carrying on business in co-partnership under the style of Spa Electric and Radio Co., 1, Church Walk, Leamington Spa, electrical and radio engineers. (Separate application of J. A. London.)—The application for discharge was heard at the Shire Hall, Warwick, recently. The Deputy Official Receiver said that the receiving order was made in November, 1933, when the liabilities were £914. The assets had realised £48, and after payment of the preferential claims a dividend of 2d. in the £ had been declared on the unsecured claims. The discharge was granted subject to three months' suspension.

C. T. Hicks, 81, High Street, Witney, Oxfordshire, electrical engineer and contractor.—This debtor's public examination took place at the County Hall, New Road, Oxford, recently. His statement of affairs showed ranking liabilities of £1,133 and net assets of £294, leaving a deficiency of £839. Debtor said that a contributory cause of his failure was competition.

J. Bold, 37, Aylesbury Street, Bletchley, radio engineer.—The receiving order was made on the debtor's own petition recently, and according to the statement of affairs filed there are ranking liabilities of £733 and net assets of £370, leaving a deficiency of £363. He attributes his failure to commencing business without capital, bad debts, and falling off of trade.

C. W. Simmons, 34, Brougham Hayes, Bath, Somerset, radio engineer.—The first meeting of creditors was held at the Official Receiver's office, 26, Baldwin Street, Bristol, on May 3rd. The statement of affairs filed showed liabilities of £462 and assets of £25. Debtor attributed his failure to lack of capital, heavy overhead expenses, failure to carry out terms imposed upon him by finance companies and inability to collect the money for sets sold. The case was left in the hands of the Official Receiver as trustee.

G. A. Wood, carrying on business as A. G. Wood, 129, Bolton Road, Darwen, electrical engineer.—The public examination was held at the County Court House, Victoria Street, Blackburn, on May 3rd, when it was stated that the deficiency amounted to £424. It appeared that debtor had previously failed, and while discharging old debts he had incurred new liabilities. The examination was closed.

T. C. Taylor, 20, Queen Street, Blackpool, electrical contractor.—This debtor attended at the Court House, South King Street, Blackpool, recently for his public examination, his statement of affairs disclosing a deficiency of £235 on liabilities of £250. He started trading as an electrical contractor at Queen Street, Blackpool, in 1933, and stated that his failure had been brought about by insufficient capital and insufficient profits to meet drawings. The hearing was concluded subject to the signing of the notes.

J. Laycock (Laycock & Ridding), electrician, "Lochend," Ellam Wood Road, Riddlesden, Keighley, Yorks.—Receiving order made April 28th on debtor's own petition. First meeting, May 12th at 71, Manningham Lane, Bradford. Public examination June 6th at the County Court, Bradford.

J. E. Mills, 18, Goodhart Way, West Wickham, Kent, and lately carrying on business at 25a, Hall Road, Peckham Rye, S.E., as F. W. Terry & Co., radio dealer.—Receiving order made April 24th on a creditor's petition. First meeting May 16th at 29, Russell Square, London, W.C.1. Public examination June 15th at the County Court, Croydon.

A. W. Schofield and **D. Tanner** (Schofield & Tanner), electrical and radio engineers, formerly trading at 673, Manchester Road, Denton.—Public examination May 22nd at the Town Hall, Ashton-under-Lyne.

W. G. Baker (Baker & Co.), radio dealer, 19a, Angel Hill, Bury St. Edmund's.—Public examination May 26th at the Guildhall, Bury St. Edmund's.

N. P. Clark, electrical dealer, Hastingwood Place, Harlow, Essex.—Discharge suspended for six months until October 5th, 1939.

W. G. Holt, electrical contractor, 7, Shalford Road, South Yardley, Birmingham.—Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, Official Receiver, released April 24th.

A. J. Phillips, wireless and domestic appliance dealer, 6, Hotel, 68, Marine Parade, Brighton, lately carrying on business at 25, St. Leonards Gardens, Hove.—Trustee, Mr. L. C. Clark, 24, Ship Street, Brighton, released April 20th.

J. H. Thompson, electrical contractor (C. M. Hawkins & Son), 186, Lodge Lane, Liverpool.—Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver, released April 24th.

F. Arrowsmith, radio dealer, 34, Great Moor Street, Bolton, and at Bury, Accrington and Blackburn.—Last day for receiving proofs for dividend May 16th. Trustees, Mr. A. O. Miles, 76, Cross Street, Manchester, 2, and Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2.

J. T. Townson, radio and electrical engineer, 97, Market Street, Dalton-in-Furness.—First and final dividend of 1s. 3¾d. in the £, payable May 12th at 16, Cornwallis Street, Barrow-in-Furness.

A. Elliott, electrical engineer, carrying on business at 14a, Hargreaves Street, and 148, Trafalgar Street, Burnley, and as Vacs Domestic Appliances at the Empress Hall, Butterworth Street, Littleborough.—Receiving order made May 3rd on debtor's own petition.

E. P. Hallybone, radio dealer and electrical engineer, 15, Kneesworth Street, Royston.—Receiving order made May 2nd on debtor's own petition.

E. H. Hague, radio engineer and wireless dealer, 59, Crowthorn Road, Ashton-under-Lyne, formerly trading at 49, Ashton Road, Oldham.—First meeting May 12th at 22, Byrom Street, Manchester. Public examination May 22nd at the Town Hall, Ashton-under-Lyne.

A. G. Field, radio dealer, 27, Station Road, Chadwell Heath, Essex.—Last day for receiving proofs for dividend May 19th. Trustee, Mr. F. E. Bendall, 4, Charterhouse Square, London, E.C.1.

A. T. Burden (Meth-Lac Works), electrical engineer, Upper Devizes Road, Salisbury.—First and final dividend of 2s. 8½d. in the £, payable May 9th at 12, Rolleston Street, Salisbury.

Company Liquidations

Varsity Electrics, Ltd., Victoria Street, London, S.W.1.—The statutory meeting of the creditors was held recently when a statement of affairs was submitted showing liabilities totalling £921 and net assets of £260, leaving a deficiency as regarded the creditors of £661. The issued capital of the company was £2, and so far as the shareholders were concerned there was a deficiency of £663, which was attributed to loss on trading and the writing down of the assets in the statement of affairs. A resolution was passed confirming the voluntary liquidation of the company with Mr. Sparks, of Sparks & Co., 333, Gray's Inn Road, London, W.C., as liquidator of the company. A committee was also appointed.

Rhondda Tramways Electric Supply Co., Ltd.—Winding up voluntarily. Liquidators: Messrs. E. A. Bond and T. H. Underhill, 88, Kingsway, London, W.C.2.

Alkaline Miners Lamps, Ltd.—Meeting May 26th at Balfour House, Finsbury Pavement, London, E.C.2, to receive an account of the winding-up by the liquidators, Messrs. A. Cripwell and L. Mitchiner.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

KNOX A.R.P. shields.

TENAPLAS spaghetti tubing.

ELECTRICITY SUPPLY

Proposed Sale of Barnoldswick Undertaking. Reduced Charges in Fife. New Ipswich Power Station Preliminary Works. Success of Film Propaganda at Fulham.

Aberdeen.—BOULEVARD LIGHTING.—Spectacular lighting may be used on the new boulevard to the beach. Mr. R. Parker, lighting superintendent, in his estimates of lighting costs, has allowed for the installation of columns and lighting fittings of an ornamental type, and for cables of a size to take a load three times greater than the demand of normal street lighting.

Ayrshire.—RURAL EXTENSION.—The County Highways Committee is to confer with the Ayrshire Electricity Board on the question of the supply of electricity to the village of Sorn.

Barnoldswick.—PROPOSED SALE OF ELECTRICITY UNDERTAKING.—The Council has reversed its decision to obtain expert advice on the proposed sale of the electricity undertaking, for which an offer has been made by Electrical Distribution of Yorkshire, Ltd. A public meeting is to be called to state the Council's case for selling out its interests.

Barrow-in-Furness.—ELECTRICITY FOR PUMPING.—The Electricity Committee is to sink a well and provide pumping equipment at the power station at a cost of £2,000.

EXTENSIONS.—Underground mains are to be laid to Newby Bridge and Staveley at a cost of £1,044 and a supply afforded to Stainton (£1,073). The Electricity Committee is also to erect lines to supply Newland and Newland Bottom at a cost of £1,300 and provide a supply to Sandscale Farm at a cost of £164.

Blackpool.—SAFEGUARDING THE SUPPLY.—The Electricity Committee has expressed concurrence with a scheme which has been prepared by the borough electrical engineer of Preston (Mr. G. A. Robertson) for the duplication of the existing main transmission lines and equipment between Preston and the Fylde Coast towns.

Brownhills.—DISCHARGE LIGHTING.—The Urban District Council proposes to have mercury vapour electric discharge lamps installed in the High Street.

Colchester.—IMPROVING THE SUPPLY.—The following revised estimated cost of a scheme to improve the supply in the south-western area has been approved by the Town Council: Extra-high-voltage line from Berechurch to Layer Brook, £1,060; and extra-high-voltage cable from Hythe generating station to Old Heath Road, £570.

Doncaster.—AIRPORT LIGHTING.—The Town Council proposes to have lighting equipment installed at the airport at a cost of £1,000.

Dartford.—CHANGE-OVER.—The Town Council is to spend £8,160 on mains, equipment, &c., in connection with the change-over of the system of supply.

Dorchester.—APPLICATION FOR A SUPPLY TO BINCOMBE.—At a recent meeting of the Rural District Council it was reported that the acting clerk to Bincombe Parish Council had written regarding a supply of electricity to the parish, and Weymouth Corporation is to be approached again in the matter.

Dover.—OVERHEAD LINE.—The Electricity Committee is to erect a 6,600 V overhead line from Noah's Ark Road to St. Radigund's Road in connection with the Folkestone-Crabble Hill high-voltage link.

Eston (Yorks).—NEW SODIUM LIGHTING INSTALLATION.—An extensive sodium street lighting scheme involving main and subsidiary roads has recently been completed. The installation comprises 150-W "Philora" sodium lamps in Revo "C. 9223" silvered mirror reflector fittings, the units, of which there are 226, being fixed by pole clamps to the existing trolley-bus poles along the various streets and roadways. Even where the fittings are on one side only there is a remarkable degree of illumination over the whole surface of the road and pavement. The mounting height is 21 ft. 6 in. and the spacing 120 ft. along main roads and 240 ft. along other roads which vary in width from 30 ft. to 40 ft.

Fife.—CHARGES REDUCED.—The Fife Electric Power Co. announces reductions in the two-part rate for supply as follows: Domestic tariff annual fixed charge for each habitable room to be 15s. per annum in place of £1 per annum for the first room and 15s. for each additional room. The fixed charge for shops and offices, &c., is also to be reduced.

Fort William.—CHANGE-OVER.—Application has been made by the Town Council for consent to alter the supply to AC.

Frinton and Walton.—STREET LIGHTING.—The Urban District Council has accepted the tender of the Colchester Corporation (£471) for street lighting scheme at Great Holland.

Great Yarmouth.—NEW FEEDER TO GORLESTON.—The Corporation is to lay an additional feeder cable from the power station to Gorleston at an estimated cost of £8,496.

Heston and Isleworth.—EXTENSION.—The Town Council is to apply for sanction to borrow £988 for the extension of the electricity mains to the new factory of Ranton & Co., Ltd., in Commerce Road, Brentford End.

Hull.—BULK SUPPLIES.—New bulk supply agreements have been arranged by the Electricity Committee with Marks & Spencer, Ltd., Priory Cinemas, Ltd., and Benninga (Hull), Ltd.

Ipswich.—PROPOSED POWER STATION.—In connection with the proposed Cliff Quay power station the Electricity Committee is to drive test piles on the site at a cost of £1,200. It is recommended that application should now be made for sanction to a loan of £1,907,125 for the scheme.

A thoroughfare at Eston, Yorks, showing the new sodium lighting installation

Lancaster.—SUPPLY EXTENSION.—The Town Council has approved a scheme for the supply of electricity to Abbeystead and Over Wyresdale at an estimated cost of £13,550.

London.—GENERATING PLANT AT POLICE STATION.—The City of London Corporation is to provide electricity generating plant at Bishopsgate police station at a cost of £2,500.

ST. PANCRAS.—The supply to the premises of Nettlefold & Sons, Ltd., is to be changed over to AC at a cost of £772. While repaving works are in progress in certain streets the opportunity is to be taken to lay mains which would in any case be required shortly. An expenditure of £1,765 is involved.

FILM PUBLICITY AT FULHAM.—In December last the Fulham Borough Council authorised an expenditure not exceeding £80 on the display of films produced by the British Electrical Development Association. Fifteen exhibitions of the films were given at the King's Hall and the Town Hall and 1,647 persons attended. In view of the success of this publicity the Electricity Committee instructed the borough electrical engineer to make arrangements for a display of the films in the Sands End district and authorised further expenditure for this purpose.

CONTRACT FOR TURBO-ALTERNATOR.—Tenders for the plant required for the extension of the Townmead Road generating station are being obtained by direct negotiation with the contractors for the first extension of the station, and the borough electrical engineer has reported that the Metropolitan-Vickers Electrical Co., Ltd., has offered to supply a 60,000-kW turbo-alternator set and condenser together with accessories for the total sum of £240,360. The estimate submitted by the borough electrical engineer for this plant was £242,550. The engineer has advised that this tender is satisfactory, and the Electricity Committee has authorised its acceptance, subject to approval. The Central Electricity Board has informed the Council that from further consideration of the cost of extending the generating station it has been found that the estimate of £1,401,550 given in the direction issued last January is inadequate, and that this should be increased to £1,469,650.

Maidenhead.—LOAN.—Sanction is being sought by the Town Council to a loan of £10,000 for prospective expenditure on mains and services.

Morecambe & Heysham.—EXTENSIONS.—The Town Council is recommended to afford a supply of electricity to the Middleton Tower estates at a cost of £1,027, and to extend the mains at Heysham, in which case the estimated expenditure is £2,375.

Newcastle-on-Tyne.—Tenants Protest.—The City Council has received a letter from the Newcastle and North-Eastern Tenants' Association protesting against the Council's decision to refer back a scheme for the installation of electricity in houses on the various estates. The Association accuses the Council of lack of foresight and protests against the statements of several councillors that "electricity is a luxury." The Council decided that the letter "be received."

School Installation.—Electricity is to be installed at the Raby Street Council School.

North-West Midlands.—Inquiry into Power Station Scheme.—The Electricity Commissioners have informed the North-West Midlands Joint Electricity Authority that, from a consideration of the objections to the Barlaston power station scheme already lodged, it appears that it will be necessary to hold a local inquiry. Wednesday, May 31st, has been provisionally fixed as the date on which the inquiry will be held.

Northumberland.—Electricity for Agricultural Centre.—The County Council proposes to spend £750 on distribution works in connection with the erection of new buildings at Cockle Park agricultural centre.

Peterborough.—Power Station Extensions.—The City Council has decided to make an application to the Electricity Commissioners for consent to the proposed extension of the generating station at an estimated cost of £28,807, and also to place the contract for a new boiler and ancillary plant, together with the required buildings, with the Spearing Boiler Co., Ltd.

Portsmouth.—New Sub-station.—The Electricity Committee is to erect a sub-station at Forestside.

Airport Lighting.—The Airport Committee is to provide lighting equipment for night flying at the airport at a cost of £8,000.

Preston.—Development Foreshadowed.—Alderman H. E. Rhodes, chairman of the Electricity Committee, stated at the luncheon during the annual inspection of the electricity undertaking that the department had more development of a capital nature in hand than at any other period during the existence of the undertaking. This meant in essence a new power station with one set working, it was hoped, by the end of 1942. There was also a possibility of a station that might have a capacity of more than twice the existing capacity in Preston. Other projects were the Fylde Coast supply, involving new lines, cables and switchgear; and the introduction of a supply system to Preston and district at 33,000 V, instead of the 6,600-V system now in use. To cope with the expansion of the undertaking, new offices and showrooms were required.

Rotherham.—Lighting Private Streets.—The Finance Committee has considered a report by the Highways Committee on the cost of street lighting equipment in new streets. The Council is recommended to undertake the cost of providing the equipment for the lighting of private streets where the owner or developer has sold the houses or other premises on or before April 1st, 1939.

Rugby.—Change-over.—The Town Council has decided to proceed with the change-over at an estimated cost of £3,792.

Scarborough.—Bulk Supply Terms.—The Town Council has approved a revision of the terms and conditions for the supply of electricity in bulk to the Buckrose Light and Power Co., Ltd.

Reorganising Electricity Undertaking.—The borough electrical engineer has prepared a report regarding the reorganisation of the electricity undertaking and the Electricity Committee has authorised the carrying out of the recommendations in the report.

Sheffield.—Mains.—The Electricity Committee has approved extensions of street mains at a cost of £16,616.

Sleaford.—Electricity for Holdingham.—A scheme has been prepared for a supply of electricity to Holdingham.

South Shields.—New Sub-station.—The Transport Department proposes to erect a sub-station near Kennedy's Corner, Tyne Dock.

Emergency Hospital Lighting.—The Town Council is to provide emergency lighting at the General Hospital at a cost of £1,608.

Reorganisation.—Application is to be made to the Electricity Commissioners for sanction to take £10,000 from the electricity reserve fund in connection with the reorganisation of the undertaking.

Stoke-on-Trent.—Supply Extension.—A distributing main is to be laid in Church Lane, Wolstanton, at a cost of £775 to supply property there and in connection with the proposed electric street lighting for the provision of which an order has been received from the borough surveyor of Newcastle-under-Lyme.

Swansea.—Advertising Electricity.—Reporting to the Electricity Committee on Tuesday, Mr. H. E. Blackiston, the new borough electrical engineer and manager, supported the method of allocating a proportion of the revenue for propaganda as being satisfactory because it provided for the steady growth of the undertaking. The British Electrical Development Association's recommendation that one per cent. of the total revenue from the sale of energy should be so allocated had, he said, been adopted by many authorities and found to be entirely adequate, and unless there were large electrical exhibitions it was never necessary to use the whole sum in any one year. There was, he said, no doubt that the undertaking should spend money on advertising in the national electrical engineering and other trade papers with a view to attracting new industries to the district. The borough treasurer, Mr. R. A. Wetherall, objected to any increase while the undertaking's annual deficiences continued. After discussion the engineer promised to prepare, with the treasurer, a report on the expenditure to date and new bases of allocation which he (Mr. Blackiston) would suggest.

Swindon.—New Switchgear.—The Electricity Committee, on the advice of Messrs. Preece, Cardew & Rider, is to replace switchgear at a cost of about £48,000.

Tutbury.—Supply to Yoxall.—The Rural District Council has decided to raise no objection to the proposal of the Lichfield Corporation to supply electricity to Yoxall.

Uttoxeter.—Extensions.—The Electricity Department is to erect a new high-voltage cable from the allotment gardens transformer and switch station at the Heath to a kiosk to be erected on the Weaver Lodge estate, near New Road. The Council has agreed to give an additional supply to Marchington, and to install a further transformer, and afford a supply to Birch Cross, at a cost of £2,800.

Walsall.—Sub-stations.—The Town Council proposes an expenditure of £12,000 on new remote-controlled rectifier sub-stations.

Wokingham.—Better Lighting.—The Town Council is to make an application for consent to the borrowing of £1,500 for carrying out a lighting improvement scheme for the shopping centre.

Wolverhampton.—A.R.P. Measures.—The Electricity Committee is to undertake A.R.P. work at a cost of £2,582.

Workington.—Street Lighting.—Washington Street is to be lighted experimentally by electricity.

Yorkshire.—Benefits of Unification.—Results of the operations of the Electrical Distribution of Yorkshire, Ltd., which, it was considered, showed the beneficial effects of unification, were set out in a report submitted by the company to the West Riding District Councils' Association yesterday (Thursday). The report stated that the company was supplying electricity in 93 local government districts and in an area of 1,228 sq. miles. Last year the number of consumers was 116,622 compared with 27,630 ten years ago, when the supply area extended to 1,170 sq. miles. In the same period the energy sales had risen from 13.5 million kWh to 60.7 million kWh, while the average price per kWh had fallen from 3.24d. to 2.59d. The company had been encouraged by the support received from local authorities in the supply to municipal estates. Last year arrangements were made with fourteen authorities for supplying electricity to more than 2,000 houses. The number of consumers adopting the two-part tariff continued to grow. However, it was obvious that in some cases the use of electricity was limited by the householders' inability to provide the necessary electrical apparatus although they wanted to employ electrical methods. To test the extent of this demand a tariff was introduced experimentally in the Stanley Order area in which the hire of a breakfast cooker, fire, kettle and wash boiler was included. The results, so far, were encouraging and it was proposed to extend the system to a further trial area.

FORTHCOMING EVENTS

Institution of Electrical Engineers (*Transmission Section*).—Friday, May 19th, to Tuesday, May 23rd. Week-end visit to Ireland.

Western Centre.—Friday, May 12th, to Monday, May 15th. Summer meeting at St. Austell, Cornwall.

Northern Ireland Sub-Centre.—Tuesday, May 16th. 9, Wellington Place, Belfast. 6.30 p.m. Annual meeting.

Irish Centre.—Thursday, May 18th. Trinity College, Dublin. 6 p.m. Annual meeting.

Association of Mining Electrical Engineers (*North of England Branch*).—Saturday, May 13th. Mining Institute, Neville Hall, Newcastle-on-Tyne. Annual meeting.

South Wales Branch.—Thursday, May 18th. Café Mona, Aberdare. 5 p.m. Annual meeting.

Lothians Branch.—Saturday, May 20th. Annual meeting.

Engineers and the Public

THE report for the year ended March last, on the activities of the Engineering Public Relations Committee, shows that the fourteen Institutions which co-operated during the first year have continued to do so, while three others were affiliated during the second year and a sub-committee has been formed for Scotland. Increasing use is being made of the services of the Committee by the Press and individual journalists, and co-operation with the B.B.C. has continued. The services of the Committee in arranging lectures are being utilised more widely and continual calls for films and lantern slides indicate a growing demand. Assistance has been rendered in the selection of engineering displays at exhibitions, while contact is being established with all sorts of organisations and individuals at home and overseas. In these and many other ways the Committee is pursuing its aim of ensuring that due publicity is given to the work of the engineer and to the services of engineering science to the community.

TRACTION

Aberdeen.—NEW TRAMS.—The Transport Committee recommends that four of the latest type of streamline tramcars, costing £3,000 each, should be built in Preston, to be delivered three months after the order is placed. The transport manager reports that to bring the tramcar fleet up to date 20 new vehicles are required and, in addition, air brake equipment for 30 of the existing vehicles.

Bath.—DISCONTINUATION OF TRAMWAYS.—Trams were withdrawn from the roads on Saturday and the services were taken over by motor-buses. The Bath tramways had been in operation for 35 years.

Cardiff.—TROLLEY-BUSES APPROVED.—By 37 votes to 14 a two year's discussion on whether Cardiff should have trolley-buses was settled by the City Council on Monday in favour of this system of transport, and the Transport Committee is to put the decision into effect immediately. Alderman Gough said that the Ministry of Transport report gave the average consumption as 2.31 kWh per mile, but he thought consumption for Cardiff should be 2 kWh per mile. He maintained that a major consideration was that the trolley-buses would use energy produced by Welsh coal instead of imported fuel. The new trolley-buses, together with the equipment, will cost the Corporation £220,000. The Transport Committee had proposed that the Newcastle-on-Tyne transport manager should be called in to advise.

Glasgow.—TRAM CONSTRUCTION PROGRAMME.—After a long discussion on May 3rd the Transport Committee resolved to advise the City Council to build another 25 tramcars of the new "streamlined" design. The Transport Department is at present engaged on an addition of 50 of these cars to the fleet, and this programme will be completed towards the end of August. The recommendation is apparently at variance with the advice of the general manager, who in a report emphasised that the new style of cars was expensive in capital and in operating costs. It is understood that the manager impressed on the Committee that in his criticism of trolley-bus development his analysis of the situation was based on comparison with the existing four-wheeled truck cars, not the new six-wheeled bogie vehicles. Development on this line would mean departure from the policy he had advocated on the trolley-bus report—that of conserving the financial stability of the undertaking. The Committee's view is that this further instalment of building can be undertaken without prejudice to examination of the position in the autumn when the four experimental truck cars which are at present under construction will be tested on service.

Rotherham.—TROLLEY-BUSES IN AN EMERGENCY.—The Transport Committee has authorised the transport manager to purchase 100 trolley poles and 12 miles of trolley wire for the purpose of substituting a trolley-bus service on certain petrol bus operated routes in the event of a national emergency.

Southern Railway.—NEW ELECTRIC LINE.—The new electric railway line from Motspur Park completed last year as far as Tolworth has now been extended to Chessington, to which trains will commence running on Sunday, May 28th.

COMMUNICATIONS

Germany.—NEW TRANSMITTER.—A *Reuter* report from Berlin states that Germany has begun the construction of a powerful new radio station at Breslau (Silesia) from which news bulletins will be broadcast in the languages of South-East Europe.

Great Britain.—POST OFFICE RELAY SYSTEM.—Some technical details of the proposed Post Office radio relay system have now been announced. Four programmes will be provided at frequencies within the long wave band, 172 kc/s., 216 kc/s., 252.5 kc/s., and 280 kc/s. (1,744, 1,388, 1,188 and 1,071 metres, respectively). Carrier spacing will vary from 44 to 27.5 kc/s., permitting high-quality reproduction. Programmes will be taken from B.B.C. and Continental studios at audio-frequency over land-lines, and will modulate small radio-frequency transmitters feeding the telephone network through filters. Electrical and atmospheric interference will thus be reduced to a negligible quantity.

A distribution box containing high- and low-pass filters and an output transformer will be provided at each subscribers' point. The output impedance will be 100 ohms, and the signal strength 10 mV. Aerial and earth terminals of a normal broadcast receiver will be connected across output terminals provided, and the receiver tuned in the normal manner. A changeover switch will enable the receiver to be used on the relay system or an ordinary aerial at will.

It is likely that special receivers will become available for use on the service to take advantage of the high-quality reception that will be possible. Such sets would be sold through normal trade channels, the Post Office having given an assurance that it is not intended to compete with private enterprise in this respect. Although the freedom of telephone relays from interference is stressed, there is to be no slackening of efforts aimed at general legislation to prohibit such interference.

Russia.—LONG DISTANCE TELEGRAPH-TELEPHONE LINE.—The Commissariat of Communications of the U.S.S.R. hopes, this year, to complete the building of the 5,415-mile telegraph-telephone line from Moscow to Khabarovsk. When the whole of this line is in operation regular communication will be assured between Moscow and the Far East and the numerous provinces and cities. The first section of the line is already finished and being handed over to a Government commission.

Aluminium Alloy Electric Vehicles

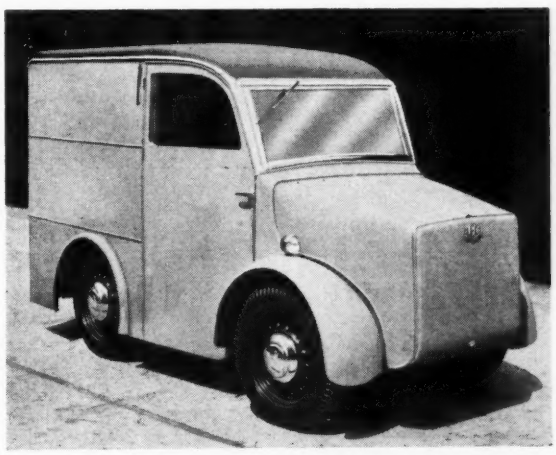
IN the construction of a new design of electric vehicle Cleco Electrical Industries, Ltd., have used aluminium alloy practically throughout. The adoption of this lightweight material makes it possible not only to reduce the chassis and body weight of a van having a maximum payload of 6 cwt. from 12 to 11 cwt. but also to incorporate a motor much more powerful and more suitable for the work for which it is intended. Actually this motor weighs one cwt. more than the type usually employed. It is of the series wound high-speed, fan ventilated type with "Class B" insulation and when the vehicle is fully loaded and running on the level at 24 m.p.h. operates at full load at its one-hour rating.

Of greater importance still is a specially designed lightweight quick-recuperating battery which, weighing only 11¾ cwt. represents a saving of 30 per cent. in weight on the battery normally used and gives an increased capacity per given weight of 40 per cent. Moreover, Mr. G. S. Jinks, the managing director of the company, pointed out that by having a longer range the battery has a further increased capacity of 10 per cent. due to the lower discharge rate. After 30 cycles of charge and discharge the 64-V battery, which is housed in two sections, half under the bonnet and half behind the rear axle, develops 240 Ah at the 5-hour rate of discharge, provided the battery is charged in not less than 8-10 hours.

Four speeds are provided, giving 3 m.p.h. (for manœuvring) and 14, 24 and 30 m.p.h., but to obtain a gentle application of torque and so reduce strain on the battery the second, third and fourth speeds each have two extra automatic speeds. The controller is of the mercury type employed on previous models.

With a total weight of 27 cwt. the following range is obtained on continuous runs:—Second speed, 75 miles; third speed, 40 miles; fourth speed, 24 miles, with about fifty stops and starts a day using second, third and fourth speeds and discharging the battery in 8 hours, the range is given as 30-60 miles, depending on the amount of fourth speed used: in similar circumstances without using the fourth speed 45-65 mile range is possible.

Double the range is, of course, obtainable by exchanging batteries. As these are self-connecting and self-disconnecting the operation can be completed in eight minutes with the aid of a loading truck. To demonstrate their confidence in



[Elec. Rev. photo.

This new "Cleco" aluminium alloy electric vehicle will be used by the Leicester Electricity Dept.

the vehicle's performance the manufacturers are proposing to run the vehicle fully loaded from London to Leicester, a distance of about 100 miles, on a single charge. High pressure tyres (50 lb. per sq. in.) help to cut down tractive resistance.

The makers are considering entering the private car field. For town use these electric vehicles certainly seem to have much to recommend them and with electricity at ½d. per kWh cost only about ½d. per mile to run.

FINANCIAL SECTION

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

British Universal E.M.E., Ltd.—Private company. Registered May 5th. Capital, £10,000. Objects: To acquire (1) the business now carried on by W. J. G. Palmer, trading as E.M.E. (Electrical Mechanical Equipment) and all or any of the assets and liabilities in connection therewith, and (2) the business now carried on by Film Recorders, Ltd., and all or any of the assets connected therewith, and to carry on the business of manufacturers of and dealers in gramophones, phonographs, cinematograph films, electrical machinery, lamps and fittings, wireless apparatus, &c. Directors: W. J. G. Palmer, 54, Queen's Gate Terrace, S.W.7; and Comdr. the Hon. Trevor Parker, Fen Place, Turners Hill, Sussex. Registered office: 30, Loughborough Street, S.E.11.

Gordon Lennox & Co., Ltd.—Private company. Registered May 6th. Capital, £1,000. Objects: To carry on the business of electrical engineers and general electrical installation contractors, lighting specialists and contractors, &c. Permanent directors: L. G. Weaver and Mrs. M. L. Weaver, both of 9, Balmoral Road, St. Andrews, Bristol, 7. Solicitors: Meade-King & Co., 22/4, Orchard Street, Bristol.

Fletcher Newman, Ltd.—Private company. Registered May 6th. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, manufacturers of or dealers in electric lamps, gas and electrical goods, glass, safety glass, radio goods, &c. Subscribers: A. Ball and H. G. Bickers, both of 25, Bloomsbury Square, W.C.1. Solicitors: Fielder, Jones & Ball, 25, Bloomsbury Square, W.C.1.

Belward Radio & Television Service, Ltd.—Private company. Registered May 5th. Capital, £500. Objects: To carry on the business of radio and television engineers, &c. Directors: N. D. M. Belassie, 104, Hawthorn Road, Bognor Regis; and E. Ward, 56, Cedar Drive, Parklands, Chichester. Registered office: 2, Odeon Buildings, London Road, Bognor Regis.

Northwood Hills Radio, Ltd.—Private company. Registered May 5th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus and in particular wireless sets, &c. Directors: F. C. Daniels, 13, Pembroke Avenue, Kenton, Middlesex; and A. Wason, 53, Bittacy Rise, Mill Hill, N.W.7. Registered office: 13, Joel Street, Northwood Hills, Middlesex.

S. D. Sullam, Ltd.—Private company. Registered May 5th. Capital, £1,000. Objects: To carry on the business of electricians, electrical and mechanical engineers, &c. Subscribers: S. D. Sullam, 29, Newman Street, W.1; and J. de Botton, 24, Eastcastle Street, W.1. Secretary: R. Chaborel. Registered office: 29, Newman Street, W.1.

Wharton Inventions (1939), Ltd.—Private company. Registered May 3rd. Capital, £5,000. Objects: To acquire any patents, brevets d'invention, licences and concessions, to carry on the business of electricians, electrical engineers, manufacturers of and dealers in electrical appliances and apparatus, &c. Permanent directors: J. D. Olding, 8, North Audley Street, W.1; A. Wilcocks, Green Fields, Waggon Road, Hadley Wood, Barnet; and W. Wharton, address not stated. Registered office: 8, North Audley Street, W.1.

General Plastics, Ltd.—Private company. Registered May 3rd. Capital, £1,000. Objects: To acquire the business of machinists and dealers in celastoid, fibre, bakelite and similar materials carried on at Albert Works, Spencer Road, Hornsey, N.8, by Wm. C. Carter, David E. Heaven and Jas. Moore. Directors: W. C. Carter, 3, Grange Road, Kenton, Middx; D. E. Heaven, 17, Briarwood Drive, Northwood, Mddx; J. Moore, 28, First Avenue, Bush Hill Park, Mddx; and S. R. Hodges, 61, Kelross Road, N.5. Secretary: B. Dove. Registered office: Albert Works, Spencer Road, Hornsey, N.8.

Liverpool Plastic Co., Ltd.—Private company. Registered May 3rd. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in plastic goods, bakelite, glass, metal, xylonite, vulcanite, mouldite, cellon, celluloid, casein, rubber or wax, &c. Subscribers: O. E. McMurdie, 46, Bamford Road, Bromley, Kent; and M. A. Abbott, 105, Cheapside, E.C.2. Secretary: Miss M. A. Abbott.

"Beeantee" Illuminations (London), Ltd.—Private company. Registered May 3rd. Capital, £500. Objects: To carry on the business of manufacturers, installers and hirers of all electric and lighting equipment for illuminating and other purposes, &c. H. Bloom, 88, Goswell Road, E.C.1 (director of Bell Electric Lamp Co., Ltd.) is first and permanent director. Registered office: 186, Bishopsgate, E.C.2.

Chiswick Electric Lamp Manufacturing Co., Ltd.—Private company. Registered May 2nd. Capital, £100. Objects: To carry on the business of manufacturers, fitters, maintainers and repairers of, agents for and dealers in electric lamps, bulbs, globes, brackets, &c. Subscribers: J. F. Holland, "Kathger," Middlewood Road, Higher Poynton, Ches; and J. Smith, 28, Penistone Avenue, Blackley, Manchester. Secretary: Josephine F. Holland.

Stormlight Electrical Co., Ltd.—Private company. Registered May 1st. Capital, £2,000. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and wholesale and retail dealers in electrical, radio and television fittings and electric lamps and shades, manufacturers of and dealers in electric lamp standards and fittings, &c. Directors: J. Weinbaum, 3, Alexander Avenue, N.W.10; and H. Wynbourne, 26, Dobree Avenue, N.W.10. Registered office: 162, Mile End Road, E.1.

Electrical Research Developments, Ltd.—Private company. Registered May 1st. Capital, £2,000. Objects: To carry on the business of manufacturers and vendors of radiological apparatus, surgical and hospital equipment, scientific research apparatus, &c. Directors: W. Rann, Dorset Cottage, Manor Road, Walton-on-Thames, Surrey; W. H. Rann, The Corner, College Avenue, Egham, Surrey; R. G. Love, Ravenscar, Gore Lane, Burnham, Bucks; and S. R. B. Love, 15, Branscombe Gardens, Winchmore Hill, N.21. Registered office: 511, Ipswich Road, Slough Trading Estate, Bucks.

A. Diggle & Co. (Refrigeration), Ltd.—Private company. Registered April 26th. Capital, £500. Objects: To carry on the business of manufacturers and repairers of and dealers in refrigerators, cold rooms, conservators and generally refrigeration and cold storage plant, machinery, equipment and accessories, electrical plant, &c. Directors: E. B. Grundy, 8, Bedford Avenue, Whalley Range, Manchester; H. Buswell, 35, Falkland Avenue, Spotland, Rochdale; and G. P. Luckman, address not stated.

Morris Electric, Ltd.—Private company. Registered May 1st. Capital, £500. Objects: To carry on the business of manufacturers and repairers of and dealers in neon signs and advertisements, dynamos, motors, armatures, magnetos, accumulators and containers, batteries, accumulators, conductors, wires, insulators, &c. Directors: C. H. Morris, electrical engineer, and Mrs. G. L. Morris, both of 615, Bordesley Green, Birmingham, which is the registered office.

Freemans (Electrical Contractors), Ltd.—Private company. Registered May 3rd. Capital, £1,000. Objects: To acquire the business of electrical, mechanical and general engineers and contractors and radio dealers carried on by the executors of the late J. Freeman at 36, High Street, Brierley Hill, Staffs, as John Freeman. G. A. Jackson, 36, High Street, Brierley Hill, is first director. Solicitors: Higgs & Sons, Brierley Hill, Staffs.

Television & General Holdings, Ltd.—Private company. Registered May 4th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers (wholesale and retail) in radio apparatus and accessories of every description, &c. F. S. Taieb, Ivy Cottage, Balfour Street, Hertford, is permanent director.

Metropolitan Amalgamated Industries, Ltd.—Private company. Registered May 4th. Capital, £100. Objects: To carry on business as electrical, mechanical and general engineers, metal makers, refiners and workers, &c. Directors: H. Rollings, 3, Hyde Park Place, W.2, and four others. Registered office: 72, Victoria Street, S.W.1.

Returns of Electrical Companies

Statements of Capital

Forest City Electric Co., Ltd.—Capital, £5,000 in £1 shares. Return dated February 10th, 1939. All shares taken up. £2,210 paid. £2,790 considered as paid. Mortgages and charges, nil.

John Ismay (Neon Signs), Ltd.—Capital, £1,005 in 1,000 preference shares of £1 and 100 ordinary shares of 1s. Return dated February 15th, 1939. All shares taken up. £1,005 paid. Mortgages and charges, nil.

London Electrical Company (Sherborne Lane), Ltd.—Capital, £10,000 in £1 shares. Return dated February 17th, 1939. 8,900 shares taken up. £8,876 paid. £24 calls unpaid. Mortgages and charges, £400.

British Resistor Co., Ltd.—Capital, £16,000 in 15,000 6 per cent. cumulative preference shares of £1 and 20,000 ordinary shares of 1s. Return dated February 25th, 1939. 3,000 preference and 2,222 ordinary shares taken up. £3,111 2s. paid. Mortgages and charges, nil.

Lithanode Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1938 (filed February 23th, 1939). 2,327 shares taken up. £627 paid. £1,700 considered as paid. Mortgages and charges, £5,000.

Galleries (Wholesale), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1938 (filed January 16th, 1939). 100 shares taken up. £50 paid. £50 calls unpaid. Mortgages and charges, nil.

Allied Electrical Industries Finance Corporation, Ltd.—Capital, £30,000 in £1 shares. Return dated February 7th, 1939. 10,000 shares taken up. £10,000 paid. Mortgages and charges, nil.

Northern Telephone & Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated February 10th, 1939. 210 shares taken up. £210 paid. Mortgages and charges, nil.

Mortgages and Charges

L. Adams, Ltd.—Satisfaction in full on April 13th, 1939, of first mortgage debenture authorised November 14th, 1938, and registered November 16th, 1938, securing £2,000.

Mortgage debenture, charged on the company's undertaking and property, including uncalled capital, dated April 26th, 1939, to secure £1,000. Holders: People's Bank, Ltd., Bentinck Buildings, Wheeler Gate, Nottingham.

G. E. T. Installation Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 6th, 1939, to secure £2,000. Holders: Bloom Trust & Investment Co., Ltd., 56, Princess Street, Manchester.

H. R. Osborne, Ltd.—Mortgage on hire-purchase agreements on which £774 1s. is outstanding and full benefit thereof dated April 21st, 1939, to secure £581. Holders: Vernon Urse (Shepherd's Bush), Ltd., 98/99, Aston Road, Birmingham.

Superlamp, Ltd.—Three charges on properties in Leyton, Brighton, Watford and Worthing, and Land Registry charge on property in Hornsey, all dated April 13th, 1939, to secure £1,300, £1,400, £650 and £900 respectively. Holders: G. M. Lister, "Hercies," Sweetcroft Lane, Hillingdon; and others.

Associated Signs, Ltd.—Particulars filed of £500 debentures authorised April 13th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

Reports and Dividends

The London Electric Wire Co. & Smiths, Ltd., held its annual meeting on May 4th when Mr. W. J. Terry (chairman and managing director), who presided, said that throughout 1938 trading conditions were difficult because of the uncertain international situation. The downward trend which started towards the end of 1937 continued throughout the first half of 1938, but during the latter part the demands of the trade remained fairly constant. They had fully maintained their position in the industry. There were no great fluctuations in the prices of their primary commodities during last year. At December 31st, 1937, the market price of electrolytic copper, their principal commodity, was £44 5s. per ton and at December 31st, 1938, it was £50 15s.

They had only a small interest in armaments, their products being complementary to those of the manufacturers directly engaged thereon. Their sales during 1938 were appreciably less than in 1937, which it must be remembered was a record year. Unspecified contracts carried forward into 1939 were lower than those brought forward at the commencement of 1938. Outstanding orders, however, bore a fair relation to current trade demands. Their export sales during the year under review increased by nearly 50 per cent., although mostly at unsatisfactory price levels due to inequitable competition through subsidised exports from foreign countries. It was wellnigh impossible to forecast the future. Speaking at the present time their trading results for 1939 should follow closely those of last year if normal conditions prevailed.

Walsall Conduits, Ltd.—Presiding at the annual meeting held on May 4th Mr. A. E. Read (chairman) said that the turnover for 1938 exceeded all previous records and continued to expand. The first part of the extensions to buildings and plant referred to last year had been completed and production therein had recently commenced. The ramifications of the electrical industry were almost endless, and they were constantly adding to their range of productions. New lines, including the "Walglow" electric fires, specialised low voltage switchgear and an under-floor wiring system.

Their trade had not been seriously interfered with by the international situation, and except that fairly considerable quantities of their goods were being used indirectly, they were not doing any rearmament work to-day. They were still maintaining their share of export trade notwithstanding the fierce world competition and difficulties of exchange. To-day they were working to full capacity in all departments, and sales for the first four months of the year compared favourably with those for the same period of 1938.

The Calcutta Electric Supply Corporation, Ltd., held its annual meeting on May 8th when Lord Meston (chairman), who presided, said that progress had been continuous and satisfactory. Their sales during the year under review reached 365 million kWh, and over 100 miles of cable was added to their distribution network. Strikes and other troubles in the jute industry and subsequent reduction of working time from 54 to 45 hours a week had the effect of reducing the sales of high-voltage power. Otherwise the market for both domestic and industrial supplies was steadily expanding, and a few more jute mills had recently contracted for a supply. The large new station at Mulajore was expected to be in commission before the end of the year.

They could not look forward to quite the same scale of profits as in their most prosperous years. The expenditure on the new power station would not give its full yield for some years, and the same was true of their interconnecting system. They had also had to concede drastic reductions in tariff of which the full effect was not yet apparent, although they had maintained a 10 per cent. dividend this year they could not hope to recommend a higher figure than 9 per cent. next year. It was their intention to issue 475,000 new ordinary shares within the next few weeks to be offered at par to the ordinary stockholders in the ratio of one new share for every £5 of stock held. The new shares would be converted into stock and rank *pari passu*, qualifying for dividends paid in respect of the full year 1939.

Cable & Wireless, Ltd., reports a net profit for the year ended December 31st of £1,001,205, as compared with £1,256,919 in the preceding year. The balance is struck after providing £131,105 for cable renewals and £64,000 for subsidiary companies' losses and other writings-off. The dividend for the year is 3½ per cent. (against 3½ per cent.), and £27,467 is carried forward (against £1,262 brought in). Mr. E. Wilshaw (chairman and managing director), in reviewing the past year, states that the directors are confident of the success of the Empire flat rate scheme which came into force in April last year.

Steps have been taken to remedy the difficulties arising from the fact of bringing many different companies and services together in one organisation. An offer has been made to the Government to create a system of wireless telegraph and telephone communication throughout the Colonial Empire without cost to the administrations or peoples concerned. The scheme provides for the equipment with wireless receiving and transmitting facilities of each of the cable stations where no commercial wireless service is already in operation. While these new facilities will be complementary to the existing cable service, their commercial use should bring additional revenue to the company.

Presiding at the annual meeting on Monday last Mr. Wilshaw said that the lower profit was mainly due to the reduction of rates on the introduction of the Empire flat rate scheme, and the contraction of world trade caused by disturbed international conditions. Since the close of last year a further step had been taken by the introduction of a reduced Empire flat rate for Press traffic, which came into force on April 15th last. All the necessary documents in connection with the new arrangements with the Governments of the Empire and the transfer of the freehold of the beam stations to the company had now been completed.

Cable & Wireless (Holding), Ltd., reports a revenue for 1938 of £1,230,010, as compared with £1,230,999 in the preceding year, to which is added investment income of £117,270, making £1,397,280. The net profit is £1,203,671 (against £1,208,246) and it is proposed to maintain the ordinary dividend for the year at 4 per cent., and to carry forward £205,282 (against £199,097 brought in).

Marconi's Wireless Telegraph Co., Ltd.—Presiding at the annual meeting held on May 9th, Mr. H. A. White (chairman), in referring to foreign debts, said that during the greater part of the last twelve years more than 80 per cent. of their sales had been to foreign countries. This proportion had decreased considerably during the last year or two, but the home market did not in normal times offer sufficient scope, so that it was of vital importance to maintain their export business with a view to renewed expansion when the world had settled down to more stable conditions.

Ten years had elapsed since they began to incur expenditure on television research, which continued for five years before they were able to collaborate through the medium of Marconi-E.M.I. Television, Ltd., in the production of a television station. During the year under review, 274 British patent applications and 874 applications in overseas countries were filed in addition to a large number of applications made in other countries by their subsidiary and associated companies. The total number of their patents now in force at home and abroad approximated to 6,500. It was gratifying to them as licensors to know that the sale of television receivers was rising in the London area with such rapidity that radio manufacturers were preparing for mass production in the near future.

Turning to their own sales, the orders obtained in 1938 came from Great Britain, five British dominions, eighteen colonies and protectorates, and forty-two foreign countries. In the current year orders had so far been coming in at the same rate as in their peak year of 1937, but in existing circumstances it was impossible to forecast the sales of the next seven months. Marconi-Ekco Instruments, Ltd., which was founded by E. K. Cole, Ltd., and their company, with equal shareholdings, for the production and sale of scientific instruments outside the field of radio, concluded its second year of activity with a reasonable prospect of slow but steady expansion.

The Calcutta Tramways Co., Ltd.—Extensions to the tramway system were foreshadowed by Sir Geoffrey R. Clarke (chairman) at the annual meeting held on May 9th, who in the course of his speech said that on some of their routes during office hours they were running 50 cars to the hour and were still unable to carry all the passengers wishing to travel. To relieve the position they had obtained the consent of the Corporation and the Government to the installation of tramways on the Upper Circular Road from Shambazar to Sealdah and on the new road being built by the Calcutta Improvement Trust from Ballygunge. The policy of replacing the older rolling stock by new cars had been continued during the year, and a further improvement in design would be incorporated in the new cars now under construction.

Parkinson & Cowan, Ltd., report a net profit for 1938 of £61,041, as compared with £60,820 in the preceding year. Reserve receives £10,000 and the ordinary dividend for the year is maintained at 3 per cent., leaving £30,959 to be carried forward (against £20,688 brought in).

The Ever Ready Co. (Gt. Britian), Ltd., reports a trading profit for the year ended March 31st of £503,913, as compared with £572,481 for 1937-38, which with interest of British Government securities and transfer fees makes £506,892. After appropriating £17,500 to directors' fees and writing off £32,434, plant, machinery, &c., there is a net balance of £456,958. As we have already announced, the final ordinary dividend is 15 per cent., making 30 per cent. for the year (against 35 per cent.), staff fund, &c., receives £6,402 and reserve £124,702. The balance carried forward is £71,136 (against £68,402 brought in).

The Cawnpore Electric Supply Corporation, Ltd., reports a surplus on the year's working for 1938 of £103,529, as compared with £104,297 for 1937, and after deducting debenture interest and adding £4,523 brought in, there is a balance of £94,552 (against £94,894). Depreciation and renewals account receives £35,000, general reserve £10,000 and income tax account £5,000. The ordinary dividend is maintained at 10 per cent. by the final payment of 7 per cent., and £8,852 is carried forward.

The East London Rubber Co., Ltd., reports net profits of £19,884 for the year ended February 28th, as compared with £26,403 for 1937-38. The ordinary dividend for the year is 2½ per cent. (against 10 per cent.).

The St. Austell and District Electric Lighting and Power Co., Ltd., reports a profit for 1938 of £12,736, as compared with £14,413, to which is added £5,994 brought in, making £18,730. General reserve receives £4,000 and a final dividend of 5 per cent. is paid on the ordinary shares, making 10 per cent. for the year (same), and a dividend at the rate of 10 per cent. per annum on the new ordinary shares issued in May, 1938. The balance carried forward is £6,620 (against £5,994 brought in). The report states that the year under review has been a difficult one, but sales of electricity continued to show an increase and substantial advances were made in the development of electric cooking in the area. This, as well as other domestic sales, has received a considerable stimulus from the reduction

of the "unit" rate under the "all purposes" two-part tariff to ¾d. as from July 1st, 1938.

The Bridgwater and District Electric Supply and Traction Co., Ltd., reports a net profit for 1938 of £8,138, as compared with £8,034 for 1937. The ordinary dividend for the year is 6 per cent. (unchanged) and £1,459 is carried forward (against £1,344 brought in). The sales of electricity during the year showed an increase of 14 per cent. as compared with 1937.

The Anglo-American Telegraph Co., Ltd., which leases its cables to the Western Union Telegraph Co. for an annual rental of £262,500, reports that with £65,625 brought in the balance available for the year ended March 31st was £328,125. The dividends for the year are maintained at 3¾ per cent. on the ordinary stock, 6 per cent. on the preferred ordinary stock and 1½ per cent. on the deferred ordinary stock. These payments, together with £70,875 for income tax, absorb a sum equal to the rental received.

Richard Johnson & Nephew, Ltd., have announced a first and final dividend of 9 per cent., less tax, for the year to March 31st.

The French Thomson-Houston Co. reports a net profit for 1938 of 10,910,000 fr. (against 10,186,000 fr. for 1937). This is carried to reserve and the dividend is passed.

Callender's Cable & Construction Co., Ltd., has announced a final ordinary dividend of 10 per cent., less tax, making 15 per cent. for the year, but no cash bonus is added this year. For each of the preceding two years the ordinary dividend has been raised to 20 per cent. by a bonus of 5 per cent., less tax.

The Associated Equipment Co., Ltd., has declared an interim dividend at the rate of 6d. per £1 unit of stock free of tax.

Siemens Bros. & Co., Ltd., have declared a dividend of 7½ per cent. (unchanged) for the year on the ordinary stock.

Stocks and Shares

TUESDAY EVENING.

THE Government's armament and defence programme is at length making its influence felt upon the industries of the country. Decided improvement in the Home Railway weekly takings is hailed as evidence of a quickened movement amongst the arteries of trade. A further fall in the unemployment figures adds its witness to the impression that rearmament is absorbing most of the slack which has prevailed in the ranks of the unemployed. From various quarters come reports of an increase in industrial activity.

The international situation appears to be, for the moment, less overclouded by imminent possibilities of conflict on the Continent. A coal strike in the United States has resulted in South Wales receiving many inquiries, and a fair number of orders, for coal on behalf of American buyers. The Government persist in refusing to outline with any precision the bounds outside which British capital is desired to eschew foreign investment.

Notwithstanding the unexpected reduction in the Callender's Cable dividend, the market for shares in the construction companies continues to be firm. (Callenders gave way from 80s. to 70s. before recovering to some extent.) Business in the Stock Exchange is a little better than it was. Members of the House are thankful to see evidence of greater interest on the part of the public in stocks and shares. One well-known trust company which issued instructions a month ago to the effect that no securities of any kind were to be bought while the position remained so obscure has already relented from its cast-iron attitude.

Brighter Home Rails

Home Railway stocks are enjoying a most unusual amount of favourable attention. Improvements of a substantial order have come about in the past few days. Speculative interest remains concerned chiefly with stocks on the border-line of safety. An example is Southern 5 per cent. preferred, on which the dividend was not quite covered by profits in 1938. This stock is 7 points better, at 67½, but the yield is still around 7½ per cent. Since the deterioration of prospects for Railway ordinary and deferred stocks in general, certain of the prior charges—such as the stock mentioned—have taken on the character of "equity" shares. Thanks largely to the bigger movement of coal and heavy goods, traffic on the railways has risen above the corresponding level of last year. There are high hopes of a marked gain in net profits by the end of the first half of the year. This week will, it is hoped, see publication of the road-rail agreement. London Transport "C" stock has risen 4 points, to 68½, in anticipation of the verdict on the appeal concluded last week, for an increase in London fares. The Board's "A" and "B" stocks are respectively 2½ and 2 points higher. Reverting to the Southern Railway's prior-charge issues, the 5 per cent. preference is 5½ points up at 91½.

Cable and Wireless Report

The annual report of the operating Cable and Wireless Company and the amplifying speech of the chairman at the meeting last Monday testify to the success of the flat rate scheme for inter-Empire communications. It was already known that the 3½ per cent. dividend was being paid without recourse to the special fund of £300,000 specifically reserved to cushion the expected costliness of the early stages of the venture. The scheme was introduced in the fifth month of the year, and seems to have gone far in saving a situation rendered particularly difficult by international events.

It is still only possible to guess at the earnings available for the holding company's stocks, in which the ordinary investor is interested, and how far these earnings suffice to cover the 5½ per cent. preference and 4 per cent. ordinary dividends already declared. Both stocks have risen 3 points on the operating concern's report. Globe ordinary shares sympathised with ⅛ advance to 27s. 6d. Great Northern Telegraphs are again 20s. up, at 30½. American Telephone and Telegraph hardened to 170½; the company's president, according to official American figures, received last year a salary of 220,000 dollars—approximately £44,000 sterling.

Equipment and Manufacturing

General Electrics, with a rise of 2s. 6d. to £4, are a good feature among electrical equipment shares. Associated Electricals, at 38s., are also better. Advances are to be noted in Automatic Telephones and English Electrics. British Aluminiums are 3s. 3d. up at 57s. 6d. In the engineering group, Babcock & Wilcox strengthened further to 42s. 6d. since publication of the full report. Tube Investments are ¼ to the good, at 87s., ex dividend, and International Combustion have gained a similar fraction, at 5⅞. A point for the market's consideration is the increase in the loans sanctioned by the Electricity Commissioners. For the year ended last March the total of slightly over £25¼ millions was more than £2½ millions above the 1937-8 figure. The importance of the electricity supply industry's expansion to the electrical manufacturers was re-emphasised at the London Electric Wire meeting. Another matter of general importance, discussed at the same meeting, concerned the unsatisfactory price conditions in export markets, which detracted from the results of a large increase in the company's overseas business. Although profits were down on the year, the company has fully maintained its position in the industry, and the financial position is strong. Direct interest in armaments is small, the products being complementary to those of the armament specialists.

Callender's Cables

The omission from the Callender's Cable dividend statement of any reference to the usual 5 per cent. bonus led, as noticed above, to a sharp relapse in the price of the shares. The announcement was accompanied by no explanation or reason to account for the reduction; and various rumours arose in the market to account for it. One of the rumours said that Callender's had contracts with various overseas customers who had either cancelled or refuted them. Other rumours, equally based on guesswork, were on somewhat similar lines.

Until the figures and the report appear it is, of course, impossible to surmise with any degree of accuracy what was the cause of this unexpected step. That it must be due to some exceptional circumstance, anticipation readily agreed. The fact that prices of Henley's, British Insulated, and other shares in the same group were scarcely affected by the Callender disappointment implies that most people assume the latter to be due to individual causes, for which, no doubt, explanation will be forthcoming in due course. The price of the shares at 72s. 6d. shows a fall of 7s. 6d.

Sur-Tax Stocks

At the present level of income-tax and sur-tax, it is natural that demand should seek stocks and shares dependant for their yield upon new issues, as much as upon the dividends distributed by the companies. British Electric Traction is one of the obvious examples. The Deferred stock receives a cash dividend of 6 per cent., which provides a negligible yield. But the company makes regular issues of new stock which yields a handsome bonus, and the surtax-payer leans towards such investments to give him relief from the burden of receiving too much cash income from dividends. The price has advanced 100 points this week, to 900. The preferred ordinary, which does not participate in the bonus, is 8 points lower at 150.

Armament Profits

While still undefined, the Government intentions to limit the profits of armament firms remain one of the weightiest unknown factors in the industrial markets. The subject came up in the Premier's speech on compulsory military service. Conscription of wealth was said to have been carried already, through the various forms of taxation, to considerable lengths. Now it is intended, in the Premier's words, "to take further steps to limit the profits of firms mainly engaged on the rearmament programme." Legislation will be introduced at any early date. Vagueness was, of course, inevitable in the first pronouncement on a matter of such complexity. Although, however, speculation is fruitless at this stage, minds are greatly exercised on the question of what amount of Government work qualifies a company to be described as "mainly engaged on the rearmament programme"; whether sub-contractors are involved; and so on. The problem covers a multitude of industrial shares generally regarded as "the right kind of thing to hold" under the circumstances of the time. Generally speaking, however, it is safe to say that opinion is not greatly apprehensive. A narrow margin of profit will content most companies in view of the expected size of the turnover in armament work. And if profit is the main incentive to efficiency and enterprise, the Government is not likely to remove the mainspring.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Previous	Dividend Last	Price May 9	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	63/9	15	15	63/9	—	4 14 4
British Power & Light	30/9	26/-	7	7	28/-	—	5 0 0
City of London	33/9	31/-	7½	7½	32/-	—	4 2 6
Clyde Valley	37/9	34/-	8	8	34/6	—	4 11 6
County of London	46/9	41/9	10½	10½	42/-	—	5 0 0
Edmundson's:							
7% Pref.	31/6	30/-	7	7	30/6	—	4 11 10
Ord.	27/9	23/-	9	9	24/-	—	—
Elec. Dis. Yorkshire	41/6	37/9	9	9	38/9	−9d.	4 12 9
Elec. Fin. and Securities	47/9	45/-	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation	51/9	48/-	12	12	47/-	−6d.	5 2 0
Isle of Thanet	20/-	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power	34/6	29/-	7½	7½	31/3	—	4 16 0
Llanelly Elec.	22/6	21/-	5½	5½	21/-	—	5 4 9
Lond. Assoc. Electric	29/3	26/3	7	7	26/3	—	5 6 8
London Electric	34/3	32/-	7	7	33/-	—	4 4 10
London Power Deb. Red.	106½	102½	5	5	102½	—	4 17 6
Metropolitan	51/-	45/3	12	12	46/3	—	5 4 0
Midland Counties	38/9	34/-	8	8	36/3	−9d.	4 8 0
Mid. Elec. Power	41/9	38/3	8	9	38/9	—	4 13 0
Newcastle Elec.	28/9	26/6	7	7	27/-	—	5 3 8
North Eastern Electric:							
Ordinary	32/3	28/6	7	7	28/6	—	4 18 3
7% Pref.	32/6	30/-	7	7	31/-	—	4 10 4
Northampton	48/-	45/-	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13¼	13	6	6	13	—	4 12 4
North Met. Elec.:							
Ordinary	46/6	41/6	10	10	42/6	—	4 14 1
6% Pref.	29/-	27/6	6	6	27/6	—	4 7 3
Richmond Elec.	29/-	27/3	7	7	27/6	—	5 1 10
Scottish Power	38/9	33/9	8	8	33/9	—	4 14 8
Southern Areas	22/9	19/6	4½	5	20/-	—	5 0 0
South London	30/9	28/-	7	7	28/-	—	5 0 0
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/-	2	2	18/-	—	2 4 5
Yorkshire Elec.	38/6	34/9	8	8	35/6	—	4 10 2
Overseas Electricity Companies							
Atlas Elec.	4/3	2/-	Nil	Nil	2/9	—	—
Calcutta Elec.	39/-	36/-	12*	10*	35/-	−1/-	5 14 3
Cawnpore Elec.	34/6	28/9	10	10	28/3xd.	+6d.	7 1 7
East African Power	26/3	22/6	7	7	25/-	—	5 14 0
Jerusalem Elec.	24/6	23/3	5	6	24/-	—	5 0 0
Kalgoorlie (10/-)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/-	29/6	8*	8	30/-	—	5 6 8
Montreal Power	34½	31	1½	1½	33	—	—
Palestine Elec. "A"	29/6	26/3	7½*	7½*	26/3	—	5 14 3
Perak Hydro-electric	18/9	15/-	7	6	15/-	—	8 0 0
Shawinigan Power	23½	20	85cts.	83cts.	21¾	+1	—
Tokyo Elec. 6%	61	50	6	6	50½	−2	11 17 8
Victoria Falls Power	72/-	60/-	12	13½	66/3	+⅝	4 1 10
Whitehall Investments Pref.	19/6	16/-	7½	7½	16/6	—	9 1 10
Public Boards							
Central Electricity:							
1950–70	112	106	5	5	106½	+½	4 14 0
1955–75	115½	108	5	5	108½	—	4 12 2
1951–73	106½	103¼	4½	4½	104½	—	4 6 2
1963–93	95½	86	3½	3½	86	—	4 1 5
London Elec. Trans. Gtd.	88½	84	2½	2½	85½	+1½	2 18 6
London & Home Counties, 1955–75	107½	106½	4½	4½	107	—	4 4 1
Lond. Passenger Transport:							
A	114½	104¾	4½	4½	107½	+2½	4 3 9
B	117½	105	5	5	107½	+2	4 13 0
C	78¼	64½	4½	4	68½	+4	5 16 10
West Midlands Joint Elec., 1948–68	112½	109	5	5	109½	—	4 11 3
Telegraph and Telephone							
American Tel. & Tel.	180	159	9	9	170½	+1	5 5 7
Anglo-Am. Tel.:							
Pref.	101½	89½	6	6	89½	—	6 14 1
Def.	23⅝	19	1½	1½	19½	+½	7 14 0
Anglo-Portuguese	24/-	19/9	8	8	21/3	—	7 10 7
Cable & Wireless:							
5½% Pref.	90¼	75	4½	5½	85½	+3	6 8 8
Ord.	49	34	4	4	45½	+3	8 16 0
Income	100	95½	—	—	95½	—	4 3 9
Canadian Marconi $1	5/3	3/9	—	Nil	4/-	—	—
Globe Tel. & Tel.:							
Ord.	28/-	23/6	5½*	7½*	27/6	+⅛	5 9 3
Pref.	26/9	23/3	6	6	23.9	+6d.	5 1 1
Great Northern Tel. (£10)	38	27½	20	20	30½	+1	6 11 2
Inter. Tel. & Tel.	10½	7½	Nil	Nil	7½	—	—
Marconi-Marine	29/-	23/-	7½	10	26/3	—	7 12 6
Oriental Telephone Ord.	2½	46/3	12*	12*	2⅛	—	4 16 0
Radio Corpn.	8⅝	6	8	6	7	+½	—
Telephone Props.	14/-	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/-)	10/-	8/6	5	6	9/3	+3d.	3 4 10
Western Union	25½	19½	2¾	—	20	+1	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref.	7/6	3/6	Nil	Nil	7/6	—	—
4% Inc.	16	7	Nil	Nil	12	—	—
British Electric Traction:							
Def. Ord.	1000	700	5	6	900	+100	—
Pref. Ord.	164	158	8	8	150	−8	5 6 8
Bristol Trams	48/6	37/3	8	10	43/9	—	4 11 2
Brazil Traction	13	7⅞	$1	—	11⅜	+⅜	—
Calcutta Trams	25/6	23/6	8	8	23/-xd.	—	6 19 2
Cape Elec. Trams	18/-	16/9	5	6	17/6	—	6 17 2
Lancs Transport	36/6	32/6	10	10	32/6	—	6 3 1
Mexican Light: 1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	65	—	7 14 0
Southern Rly:							
5% Prefd.	71	48	5	5	67½	+7	7 8 2
5% Pref.	97½	80	5	5	91½	+6½	5 9 3
T. Tilling	48/-	39/6	10	10	43/9	+1/9	4 11 3
Tilling & B.A.	53/-	50/-	10	9*	52/6	—	3 8 7
West Riding	37/9	31/3	10	10	32/-	+9d.	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	28/9	15	15	28/9	−⅛	10 0 0
Assoc. Elec.:							
Ord.	45/3	34/9	10	10	38/-	+6d.	5 5 3
Pref.	36/6	34/-	8	8	32/6	+1/-	4 18 6
Automatic Telephone & El.	46/6	39/3	10	12½	43/9	+⅛	5 14 2
Babcock & Wilcox	42/9	37/-	10	12½	42/6	+⅛	5 17 8
British Aluminium Ord.	57/-	48/9	12½	12½	57/6	+3/3	4 7 0
British Insulated Ord.	88/-	77/-	20	20	4	−⅛	5 0 0
British Thermostat (5/-)	16/-	12/-	18½	18½	13/3	—	6 19 7
British Vacuum Cleaner (5/-)	22/6	18/6	40	40	18/9	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/-	—	—
Callender's	92/-	70/-	20	15	72/6	−⅜	4 2 8
Chloride Elec. Storage	82/3	73/-	15	20	3¾	—	5 6 8
Consolidated Signal	96/-	80/9	36½	36½	82/6	—	8 16 9
Crabtree (10/-)	25/6	21/6	17½	17½	22/6	—	7 15 7
Crompton Parkinson:							
Ord. (5/-)	21/-	14/9	12½	15	17/6	—	—
E. K. Cole (5/-)	9/-	4/-	5	10	5/3	—	9 10 6
Elec. & Musical Industries (10/-)	14/9	8/9	10	5	11/6	+1/-.	4 7 0
Electric Construction	38/6	30/6	10	12½	35/-	—	7 2 10
Enfield Cable Ord.	58/6	2½	25	16½	50/-	—	6 10 0
Electrical Switchgear (10/-)	27/-	23/9	16	16	23/9	—	6 14 9
English Electric	36/-	30/3	10	10	34/-	+1/6	5 17 8
Ensign Lamps (5/-)	14/6	13/9	—	25	14/-	—	8 18 6
Ericsson Tel. (5/-)	43/-	35/-	25*	25*	38/9	—	3 4 5
Ever Ready (5/-)	24/-	19/3	35	30	19/6xd.	—	7 14 0
Falk Stadelmann	27/-	25/-	10	10	25/-	—	8 0 0
Ferranti Pref.	25/6	23/6	7	7	22/6	−1/6	6 4 5
G.E.C.:							
Pref.	31/9	29/3	6½	6½	27/6	—	4 14 6
Ord.	82/-	70/9	17½	20	80/-	+½	5 0 0
Greenwood & Batley	27/6	24/6	7	15	26/3	—	11 8 2
Hall Telephone (10/-)	22/3	19/3	15	15	19/6	+⅛	7 14 0
Henley's (5/-)	21/-	17/9	20	20	18/9	—	5 6 8
4½% Pref.	23/-	21/6	4½	4½	22/6	—	4 0 0
Hopkinsons	43/9	37/3	12½	15	42/-	—	7 2 10
India-Rubber Pref.	21/-	20/-	5½	5½	21/3	—	5 3 6
Intl. Combustion	117/-	97/-	32½	32½	5⅛	+⅕	5 17 0
J. Lucas	60/-	52/-	15	15	57/6	—	5 4 4
Johnson & Phillips	41/-	32/-	10	12½	37/6xd.	+⅛	6 13 6
Lancashire Dynamo	68/-	60/-	25	25	60/-	—	8 6 8
Laurence Scott (5/-)	12/-	10/-	15	15	10/-	—	7 10 0
London Elec. Wire	31/6	29/-	12	7½	29/6xd.	—	5 1 8
Mather & Platt	50/-	42/6	13½	13½	45/-	−9d.	6 0 0
Metropolitan Elec. Cable Pf.	21/3	21/-	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	72/6	—	5 10 5
Pye Deferred (5/-	13/9	7/6	5	25	10/-	—	12 10 0
Revo (10/-)	35/6	32/3	12	17½	32/6	—	5 7 8
Reyrolle	61/-	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	22/6	—	6 13 4
Strand Elec. (5/-)	5/6	4/9	5	10	5/-	—	10 0 0
S. Smith (1/-)	9/9	6/-	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/-)	15/-	11/3	20	20	11/3	—	8 18 0
Telegraph Condenser (10/-)	7/6	5/-	5	5	7/6	—	6 13 4
Telegraph Construction	2½	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/-)	10/-	8/-	9	9	8/6xd.	—	5 6 0
Tube Investments	91/-	82/9	23½	23½	87/-xd.	+½	5 10 4
Vactric (5/-)	4/3	2/3	10	4	3/9	—	5 6 8
Vickers (10/-)	24/6	19/6	10	10	19/6	—	5 2 7
Westinghouse Brake	54,9	43,9	17½	17½	46/3	—	7 11 4
Walsall Conduits (4/-)	31/9	24/-	55	55	26/3	—	8 7 8
West, Allen (5/-)	7/6	5/9	7½	10	6/6	—	7 13 10

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

18630. "Electric control systems." T. A. Cohen. July 5th, 1937. (503590.)

18908. "Correlated adjustment of resistances, capacities and inductances in electric circuits." R. Cain. July 7th, 1936. (503829.)

19021. "Electric valve converting apparatus." British Thomson-Houston Co., Ltd. July 8th, 1936. (503592.)

21640. "Means and method of operating electron multipliers." Farnsworth Television, Inc. August 13, 1936. (503671.)

21714. "Cathode-ray tubes operated with high tension." Radioakt-Ges. D. S. Loewe. August 7th, 1936. (503520.)

22575. "Tuning-indicators for radio receivers." J. F. Hromadko. November 17th, 1937. (503596.)

24045. "Electric musical instruments." F. Ropohl. September 2nd, 1937. (503598.)

24362. "Electrically or mechanically propelled vehicles." W. V. Ford. September 7th, 1937. (503604.)

24434. "Irreversible control mechanism more particularly for electric induction regulators." British Thomson-Houston Co., Ltd., B. Adkins and J. R. Tole. September 7th, 1937. (503605.)

24556. "Pianoforte keyboard electric indicator." H. S. Garratt and T. H. Powlson. September 9th, 1937. (503606.)

24900. "Telephony systems comprising thermionic valves." W. J. C. Chapple. (Siemens and Halske Akt.-Ges.) September 13th, 1937. (Convention date not granted.) (503833.)

26801. "Electric signalling systems." General Electric Co., Ltd., and E. P. L. Westell. October 4th, 1937. (503758.)

27065. "Magneto-generators." Ericsson Telephones, Ltd., and H. J. Melton October 6th, 1937. (503759.)

27090. "Circuit arrangements for electric heating apparatus." R. H. Rogers. October 6th, 1937. (503526.)

27140. "Telephone systems." Automatic Telephone and Electric Co., Ltd., J. W. McClew, and I. T. Richards. October 6th, 1937. (503761.)

27180. "Electron multipliers." Baird Television, Ltd., and V. A. Jones. October 7th, 1937. (503762.)

27182. "Television and like systems." Baird Television, Ltd., and A. H. Gilbert. October 7th, 1937. (503529.)

27195. "Manufacture of thermionic valve devices." J. L. Amiot. October 8th, 1936. (503763.)

27239. "Metal-vapour electric convertors." General Electric Co., Ltd., and E. Gallizia. October 7th, 1937. (503531.)

27240. "Adjustable mounting devices for use, for example, in supporting lighting fittings or the like." General Electric Co., Ltd., and S. Hubbold. October 7th, 1937. (503764.)

27336. "Electric cables." A. D. Blumlein. October 8th, 1937. (503765.)

27399. "Electric flashlamps." British Thomson-Houston Co., Ltd. October 8th, 1936. (503540.)

27479. "Electric lampholders." British Thomson-Houston Co., Ltd., and E. B. Tuppen. October 9th, 1937. (503544.)

27480. "Electric-discharge tubes." C. A. Laise. October 9th, 1937. (503616.)

27505. "Electric incandescent lamps." Vestric Lamp Co., Ltd., and J. A. Cook. October 9th, 1937. (503546.)

27507. "Interlocked electric switches." S. Smith & Sons (Motor Accessories), Ltd., and E. B. Moss. October 9th, 1937. (503617.)

27556. "Air-tight joints between metals and ceramic materials in components for use in high-frequency electric circuits." Telefunken Ges. für Drahtlose Telegraphie. October 10th, 1936. (503771.)

27558. "Devices for use in high-frequency electrical circuits." Telefunken Ges. für Drahtlose Telegraphie. October 10th, 1936. (503618.)

27631. "Electromagnetically operated brakes." W. Scott. October 11th, 1937. (503776.)

27683. "Means for electrically indicating at a distance the condition of the flame of a railway signal or like lamp." W. G. Tomlin and Lamp Manufacturing & Railway Supplies, Ltd. October 12th, 1937. (503553.)

27704. "Telephone receivers." Standard Telephones & Cables, Ltd., and J. S. P. Roberton. October 12th, 1937. (503676.)

27732. "Thermostatic electric switches." J. E. Sherlock and British Thermostat Co., Ltd. October 12th, 1937. (503619.)

27749. "Electric convertors." W. Ziegenbein. October 13th, 1936. (503683.)

27751. "Electrolytic condensers." A. H. Hunt, Ltd., and J. H. Fisher. October 12th, 1937. (503684.)

27772. "Combination electric lamp and battery tester." F. T. Chiverton. October 13th, 1937. (503620.)

27794. "Oscillation interrupter levers of electrical ignition devices for internal-combustion engines." R. Bosch Ges. October 16th, 1936. (503781.)

27810. "Holders for electric-light bulbs and like purposes." B. J. Legg Industries and B. J. Legg. October 13th, 1937. (503919.)

27899. "Electric switches." A. Cianchi. October 13th, 1937. (503843.)

27905. "Receiving devices for remote-control systems." Telefonaktiebolaget L. M. Ericsson. October 15th, 1936. (503795.)

27929. "Television transmitting and receiving systems." A. D. Blumlein. October 14th, 1937. (503555.)

27975. "Method and means for determining magnetic polarity." Standard Oil Co. of California. January 25th, 1937. (503849.)

27995. "Electron-discharge devices for translating mechanical movements into electrical variations." Marconi's Wireless Telegraph Co., Ltd., and G. F. Brett. October 14th, 1937. (503852.)

27996. "Microphones." Marconi's Wireless Telegraph Co., Ltd., and G. B. Banks. October 14th, 1937. (503853.)

28099. "Methods of operating electron-discharge devices for television and like systems." Fernseh Akt.-Ges. October 15th, 1936. (503858.)

28225. "Electrically sensitive relay devices for controlling the operation of regulating devices." J. Meech, Meech Electric Drives, Ltd., and A. H. Cartwright. October 16th, 1937. (503870.)

28375. "Electric dry batteries." C. M. R. Balbi. October 18th, 1937. (503875.)

28420. "Superheterodyne radio receiver." E. K. Cole, Ltd., and G. Bradfield. October 19th, 1937. (503876.)

28511. "Traffic control systems." Automatic Telephone & Electric Co., Ltd., T. P. Priest, G. W. Thompson and J. H. Taylor. October 19th, 1937. (503798.)

28790. "Electric signalling installations." Autophon Akt.-Ges. October 21st, 1936. (503803.)

30165. "Electric control and/or indicating apparatus." Brown Instrument Co. January 9th, 1937. (503632.)

33010. "Radio receivers with automatic volume control." E. K. Cole, Ltd., and H. A. Brooke. November 30th, 1937. (503638.)

33859. "Electric lamps and more particularly cathode glow discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). December 7th, 1937. (503639.)

1938

100. "Apparatus for transmitting tele vision and the like." General Electric Co., Ltd., and D. C. Espley. January 3rd, 1938. (503692.)

1402. "Multiplex telephony and the like." F. C. P. Henoteau. January 16th, 1937. (503881.)

1493. "Electric flat-irons." R. Engler. January 21st, 1937. (503572.)

6069. "Coupling systems for wireless aerials." H. Mayr. February 25th, 1938. (503698.)

14317. "Electrolytic refining of aluminium." Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges et Camargue. May 14th, 1937. (503578.)

17322. "Phase-changer for alternating voltages." Standard Telephones & Cables, Ltd. July 3rd, 1937. (503582.)

19781. "Radio direction-finders." Telefunken Ges. für Drahtlose Telegraphie. July 3rd, 1937. (503892.)

19902. "System employing cathode ray oscillographs." Standard Telephones & Cables, Ltd. July 5th, 1937. (503893.)

22108. "Navigation-aiding radio transmitting installations." Marconi's Wireless Telegraph Co., Ltd. July 28th, 1937. (503717.)

23206. "Amplifier with negative feedback." Standard Telephones & Cables, Ltd. (Siemens & Halske Akt.-Ges.). August 5th, 1938. (503722.)

26567. "Photo-electric cells." Electric Research Products, Inc. September 24th, 1937. (503738.)

32132. "Galvanic batteries." Chloride Electric Storage Co., Ltd. August 5th, 1938. (503905.)

34117. "Receivers for frequency modulated carrier-waves." Fides Ges. für Die Verwaltung und Verwertung von Gewerblichen Schutzrechten. January 3rd, 1938. (503907.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 3rd.

Hamilton Beach. No. 575137. Class 6 (III). Electric vacuum cleaning machines, electric drink mixing machines and electric food mixing machines. Scovill Manufacturing Co., Waterbury, Conn., U.S.A. (British representatives, Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2).

Stanelco. No. 603224. Class 7 (IV). Machine tools and parts thereof, and spraying machines. No. 603228. Class 11 (IV). Installations and apparatus, and parts thereof, for refrigeration and air conditioning. Standard Telephones and Cables, Ltd., trading also as Stanelco Products, Connaught House, 63, Aldwych, W.C.2.

Birlec. No. 604807. Class 7 (IV). Machinery and parts thereof. No. 605808. Class 11 (IV). Installations for heating, refrigeration and ventilating. Birmingham Electric Furnaces, Ltd., Birlec Works, Tyburn Road, Erdington, Birmingham.

Mercrata. No. 602047. Class 9 (IV). Electric induction apparatus. The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Fluvent. No. 605028. Class 9 (IV). Electrical apparatus and instruments. Parmiter, Hope & Sugden, Ltd., Fluvent Works, Vernon Street, Longsight, Manchester.

Vitagrill. No. 605562. Class 11 (IV). Electric cookers. Vitagrill, Ltd., 146, Bishopsgate, E.C.2.

Floralex (lettering and design). No. 604204. Class 11 (IV). Electrically illuminated artificial floral decorations. Premier (Mechanical), Ltd., 106, Kew Road, Richmond, Surrey.

Grillux (lettering and design). No. 604213. Class 11 (IV). Electrical apparatus and installations for grilling, and parts thereof. Vilem Grab, 3, Kolovara, Prague, Czechoslovakia (British representatives, A. A. Thornton, 7, Essex Street, Strand, W.C.2).

Weather Vane (lettering and design). No. 605532. Class 11 (IV). Installations and apparatus and parts thereof for air conditioning and ventilating. Carrier Engineering Co., Ltd., 24, Buckingham Gate, Westminster, S.W.1.

Neco (lettering and design). No. 600716. Class 12 (IV). Electrically propelled vehicles, trucks and boats, tyre pumps, and windscreen wipers. The Normand Electrical Co., Ltd., Neco Works, 2, North Street, Clapham Common, S.W.4.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdare.—May 19th. U.D.C. Switchgear and extra-high-voltage cable. (See this issue.)

Aberdeen.—May 17th. Education Committee. Electric lighting at Stoneywood schools. Director of Education, County Council.

Town Council. Electrical and heating work at Nursery School and Child Welfare Centre, Hilton Avenue, and at Sunnybank School. Town Clerk.

Aberystwyth.—May 17th. Electricity Department. 6,600-V and low-voltage underground cables and overhead distribution line material. (April 28th.)

Australia.—MELBOURNE. — May 23rd. Posts and Telegraph Department. Quantities of underground cable. (T. 21680/39.)*

Belfast.—June 2nd. Electricity Department. 145,000 tons of coal, water cleaning screen, mild-steel galleries and stairways and an electrically operated lift at Harbour power station; steel poles for street lighting lanterns. (See this issue.)

Birmingham.—May 17th. Electric Supply Department. Cable jointing compound for twelve months. (May 5th.)

Burnley.—May 15th. Electricity Department. Cables. (May 5th.)

June 3rd. Lighting installation in Parish Church. (See this issue.)

Clydebank.—Town Council. Electrical work at Mountblow housing estate (224 houses). Town Clerk (deposit £1).

Croydon.—May 18th. Electricity Department. Stores and materials for twelve months. (May 5th.)

Dukinfield.—Corporation. Installation of 15-A dual power plugs and replacement of the present 5-A power plugs, with plugs in twenty-two houses on the Dewsnap Lane housing site.

Dundee. — May 15th. Markets and Baths Committee. Electric lighting installation and heating work at new offices, &c., at slaughterhouses. Town Clerk.

May 15th. Housing Committee. Electric lighting installation at Kirkton estate. Town Clerk.

Ealing.—June 1st. Electricity Department. Jointing materials, general stores and pavement frames and covers for twelve months. (See this issue.)

Hull.—May 16th. Electricity Department. Sliding surface and screw-cutting general-purpose lathe. (May 5th.)

Kettering.—May 15th. Electricity Department. One 3,000-kVA transformer, metal-clad switchboard, switch units and one control panel. (April 28th.)

Leeds.—June 1st. Sewerage Committee. Sewage-pumping equipment, comprising electrically driven centrifugal pumps, motors, control and switchgear, cables, cast-iron pipes, valves and instruments in the main pumping station, Low Level Works, Knostrop. Town Clerk's Office, Room 57, Civic Hall (deposit £2).

Liverpool.—May 19th. Electric Supply Department. Eight 5,000-kVA step-up transformers, two 25,000-kVA and four 15,000-kVA step-down transformers, two 33,000-V circuit-breaker units, one thirteen-panel 11,000-V switchboard and sundry 11,000-V oil-immersed isolating switches. (May 5th.)

May 26th. Electric Supply Department. High- and low-voltage switchgear for

London.—COMMISSIONERS OF H.M. WORKS.—May 19th. Cable at the Royal Ordnance Factory, Bishopton. (April 28th.)

H.M. OFFICE OF WORKS.—May 31st. Electric wiring installation at Glascoed R.O.F. (See this issue.)

Manchester.—May 15th. Electricity Department. Steel casings for grit arrestors at Barton power station, mercury arc rectifiers, and steel cubicle type switch cubicles. (May 5th.)

Newcastle-under-Lyme. — May 26th. Electricity Supply Department. Three extra-high-voltage switch cubicles, and e.h.v. and l.v. metering equipment for sub-station. (See this issue.)

New Zealand.—AUCKLAND.—May 29th. Electric Power Board. 2,000 yd. of 4-core, 0.04 sq. in. cable, 4,000 yd. of 4-core, low-voltage cable, and 5,000 yd. of 4-core special low-voltage cable. (T. 21821/39.)*

WELLINGTON.—June 7th. Public Works Department. Six 11,000/460/230-V single-phase transformers. (T. 21908/1939.)* 260 highway lighting units. (T. 21907/1939.)*

Newport.—June 1st. Electricity Department. Civil engineering works, including pipework and river outfall, in connection with additional circulating water supplies at the East power station. (See this issue.)

Plymouth. — May 27th. Electricity Supply Department. Two 33,000/6,600-V transformers and auxiliary apparatus. (See this issue.)

Portsmouth.—May 15th. Electricity Undertaking. 11-kV overhead line at Compton and West Marden, Sussex. (May 5th.)

Roxburgh.—May 17th. County Council. Electrical work at Denholm and St. Boswells housing estates. County Clerk, Newtown St. Boswells.

South Africa. — JOHANNESBURG. — May 17th. City Council. Quantities of 30-A and 100-A cutouts for pole mounting. (T. 21746/39.)*

May 20th. 1,300 300-A, 6,600-V isolating links for use in pillar boxes. (T. 21877/39.)*

May 18th. Public Works Department. One self-cooled transformer and one low-voltage and one high-voltage switch. (T.Y. 21315/39.)*

PRETORIA.—May 18th. Union Tender and Supplies Board. Switchgear, transformers and cables for the Waterkloof Air Station. (T. 21316/39.)*

May 25th. Five 60-gal. and two 30-gal. automatic electric water heaters. (T. 21751/39.)*

June 8th. Four loading coil pots, stubless type, each containing eighty-three 120 millihenry coils. (T. 21747/39.)*

Spenborough.—May 25th. Electricity Department. 2,300 yd. of 11,000-V cable and a similar length of multi-core pilot cable. (See this issue.)

Stornoway.—May 24th. Town Council. Electrical work at seventy-four houses. Town Clerk (deposit £2 2s.).

Stretford.—May 20th. Borough Council. Switchboard, alarm equipment, &c., for new central fire station and adjacent houses. Borough surveyor, Town Hall (deposit £2 2s.).

Swansea.—May 27th. Electricity Department. Mercury-arc rectifier equipment. (See this issue.)

Uruguay.—MONTEVIDEO. — June 5th. State Electricity Supply and Telephones Administration. Fifty-two oil-cooled, three-phase, outdoor-type potential transformers, with spares. (T. 21720/1939.)*

May 22nd. Metering, control and regulation apparatus for generating sets at various power stations. (T.Y. 21721/39.)*

Walton and Weybridge.—May 16th. Electricity Department. Low-voltage, p.i., lead-covered and steel tape armoured cables and domestic wash-boilers for twelve months. (April 28th.)

May 16th. Two 300-kVA transformers and two 11-kV pedestal-type switches. (May 5th.)

Weymouth and Melcombe Regis.—May 30th. Electricity Department. Extra-high-voltage switchgear and transformers. (See this issue.)

Worcestershire.—June 2nd. County Council. Lighting and power installations at nurses' home to be erected at Kidderminster. E. S. Hoare, consulting engineer, Lancaster House, 67, Newhall Street, Birmingham.

Orders Placed

Barking.—Electricity Committee. Accepted. Electrical installations at the gymnasium and dining centres at Eastbury and Erkenwall Schools (£640).—Harland & Wolff.

Barrow-in-Furness. — Electricity Committee. Accepted. Superheater tubes (£306).—Stirling Boiler Co. Bus-bars (£216) and kiosk (£754).—Met.-Vick. Elect. Co.

Birkenhead. — Electricity Committee. Accepted for twelve months. Low-voltage switchgear.—Crompton Parkinson; G.E.C.

Dumfries.—Town Council. Accepted. Two 300-kVA transformers (£298).—Bonar, Long & Co.

Durham.—County Council. Accepted. Electrical installation at Houghton-le-Spring police station (£368).—Falconar, Cross & Co.

Eccles.—Electricity Committee. Accepted. Transformer (£171).—Electric Construction Co.

Leeds. — Hospital Committtee. Accepted. Electrical installation at Harehills centre (£309).—F. H. Sowden.

London.—FULHAM. — Electricity Committee. Recommended. One 60,000-kW turbo-alternator set and condenser, together with accessories (£240,360).—Met.-Vick Electrical Co. Maintenance of neon installations at the Town Hall, Public Baths, Electricity Showrooms and Central Sub-station for three years.—Major Equipment Co. One 300-kVA Scott-connected naturally air-cooled transformer (£279).—Met.-Vick Electrical Co.

CAMBERWELL.—A.R.P. Committee. Recommended. Diesel lighting sets for town hall and two depots (£1,604).—Ruston & Hornsby.

Manchester. — Electricity Committee. Accepted. Multi-core wiring for Barton emergency control board.—Hackbridge Cable Co.; Mersey Cable Works. Mercury arc rectifier equipment for trolley-bus sub-stations.—Hewittic Electric Co. Transformers.—Hackbridge Electric Construction Co. Electric street lanterns and auxiliary gear.—Wardle Engineering Co.

Middleton.—Town Council. Accepted. Extra high-voltage cables.—Britannic Electric Cable & Construction Co. Low-voltage cables.—Lancashire Cables.

Motherwell.—Town Council. Accepted. Electrical work at 276 houses.—Stephen Harvie.

Northumberland. — County Council. Accepted. Electrical installation at Woodhouse Homes (£9,035).—Devereux, Moodie & Co.

Oldbury.—Works Committee. Accepted. Lanterns for Wolverhampton Road (£2,041).—G.E.C.

Rotherham.—Transport Committee. Recommended. 600-kW rectifier plant (£3,000).—Hewittic Electric Co.

Salford.—Electricity Committee. Recommended. Isolating switch for Trafford sub-station (£202).—Yorkshire Electric Transformer Co.

Sheffield.—Corporation. Accepted. Remote load indication equipment at Blackburn Meadows and Neepsend generating stations.—A. Reyrolle & Co.

Electricity Committee. Accepted. Automatic telephone installation (£4,883).—Automatic Telephone & Electric Co. Remote load indication equipment (£1,159).—A. Reyrolle & Co.

Stoke-on-Trent. — Electricity Committee. Accepted. Mains and cables and overhead transmission lines.—Callender's. 33-kV outdoor switching station, Burslem.—G.E.C.

Walthamstow. — Town Council. Accepted. High- and low-voltage and multi-core cables for two years.—Henley's.

Workington. — Electricity Committee. Recommended. Cables.—Henley's.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick. — Development of cleared areas; U.D.C. surveyor.

Anerley. — Mental hospital; L.C.C. architect.

Atherton.—Houses (30), Norfolk Road, Hag Fold estate; G. & J. Seddon, contractors, 5, Manchester Road West, Little Hulton, near Bolton.

Barking.—Extensions to factory of Rodenside Engineering & Manufacturing Co., Ltd., Ripple Road.

Barnet.—Technical school, Wood Street (£66,625), for E.C.; Lanchester, Lodge & Davis, architects, 19, Bedford Square, London, W.C.1.

Batley.—Houses (162), off Fieldhead Lane, Birstall, and houses (36), Wilton Park estate; borough surveyor.

Birkenhead. — Houses (42), between Helmongham Road and Green Lane, for T.C.; borough engineer, Town Hall.

Birmingham.—New block (300 beds) at Birmingham Infirmary, for P.A.C.; Martin & Martin, and W. H. Ward, architects, 106, Colmore Row.

Blyth (Northumberland). — Houses (900); T. Wilson, borough surveyor.

Bolton.—Senior school at White Bank; Education Committee. Houses (44), Cameron estate (£14,110); J. W. Cassel & Co.

Bournemouth.—Fire station (£20,000), Winton; borough surveyor.

Bristol.—Houses (74), Knowle estate (£26,332); John Knox. Houses (84), Bedminster estate (£28,424); E. A. W. Poole & Son.

Cardiff.—Club house, &c., aerodrome (£12,000); city engineer. Houses (82), College Road and 14, Tyndall Street; city engineer. Extensions to Cardiff Royal Infirmary (£160,000), for Governors; Haymills (Contractors), Ltd., Hanger Lane, London, W.5.

Chelmsford.—Extensions to factory of Christy Bros. & Co., Ltd., Broomfield Road.

Cheltenham. — Students' hostel (£61,956), Fullwood Park, for St. Mary's College; T. Broad, Ltd., contractors, Graham Works, Great Malvern.

Cheshire.—Police headquarters, Sandiway, for C.C.; F. A. Browne, county architect, The Castle, Chester.

Cleator Moor (Cumberland).—Store for the Co-op. Society; C.W.S. Building Dept., West Blandford Street, Newcastle-on-Tyne.

Coleshill. — Extensions to Home (£20,000); Harrison & Cox, architects, 109, Colmore Row, Birmingham.

Congleton. — Operating theatre and cubicles, for Congleton & District Joint Hospital Board; I. Ferrand, clerk.

Coventry. — Houses (24), Macdonald Road; A. H. Coltman, 143, Barker Butts Lane. Schools at Keresley Grange, with provision for air-raid protection; Roff Hellberg, 13, Queen Victoria Road.

Droitwich. — Houses (28), Kidderminster-Worcester Road, Waresley; C. McWhirter.

Dudley.—New school (£17,071), Bowling Green estate, for T.C.; Jakeman & Round, builders, Hellier Street. Extensions to Atlas works, Netherton; Clydesdale Stamping Co.

Dumfriesshire.—Church, Eaglesfield; Alex. Wilson, chairman of Church Building Committee, Eaglesfield.

Durham.—Rebuilding Holywood Hall Sanatorium for the C.C. (£54,000); Kettlewell, Son & Co., builders, 11, Colonial Street, Hull. Cinema for F. Iseton; P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne. Orthopædic Hospital at Leamside, for the Durham Orthopædic Association; G. H. Carruthers, secretary, Hallgarth House.

Edinburgh. — Houses (67), at Corstorphine; Carleton Henry Dunlop, builders, 44, Frederick Street.

Epsom.—Art school (£22,000); Surrey Education Committee.

Farnham.—Extensions to county hospital; Saxon Snell & Phillips, architects, 9, Bentinck Street, London, W.1.

Feltham. — Rebuilding St. Vincent's Homes, Faggs Road (£35,000); W. Moss & Sons, Ltd., builders, North Circular Road, N.W.2.

Glamorganshire.—Schools, Reynoldston and Porthcawl, for C.C.; D. J. Parry, clerk, Glamorgan County Hall, Cardiff.

Hertfordshire.—Senior school (£50,330), Bishop's Stortford, for E.C.; county architect, Hertford.

Hexham.—Offices; R.D.C. surveyor.

Holland. — Senior school (£16,000), Butterwick, for E.C.; J. R. McKnight, director of education, Holland House, High Street, Spalding.

Hornchurch. — Houses (145), Amery Gardens; Wood & Wren, Ltd., Greenfell Works, Greenfell Avenue, Romford.

Hull. — Grammar school, Bricknell Avenue, for T.C.; city architect, Guildhall.

Ilford.—Houses (900), Claybury Park Estate, Woodford Avenue; Home Counties Construction Co., 2, Clayhall Avenue.

Kettering.—R.C. Church, London Road (£7,000), for Rev. W. H. Hunting; builder, C. Adams & Co., Wellingborough. New works in Eskdaill Street for Montagu Engineering & Knife Co.

Kilmarnock.—Warehouse and offices (£250,000), for John Walker & Sons, distillers; J. Nicholson, director.

Lanarkshire. — Police station and houses at Baillieston, for County Council; architect, County Council, Hamilton.

Lancashire.—Nurses' home and cottage at the County Mental Colony, Bury New Road, Prestwich, for Committee of Visitors; Cruickshank & Seward, architects, 14, Princess Street, Manchester.

Leeds.—Houses (90) and flats (48), on Council estates; city architect. Extensions to jam factory at Bath Lane; Yorkshire Preserving Co.

Lichfield. — Houses (250), Parkridge Road, Brindley Heath; R. Shaw & Co., Ltd., Erdington.

Liversedge.—Houses (26), Roberttown Lane, Liversedge; E. & F. Lapish, builders, Halifax Road, Brighouse.

Lincoln.—Hospital extensions (£35,000); architects, Watkins & Coombes, St. Edmonds Chambers, Bank Street.

London (W.1).—Offices and showrooms, 38, Berkeley Square (£250,000); H. Neal, Ltd., contractors, 117, Baker Street.

Macclesfield.—Convalescent Home at Upton Priory, for the Visiting Committee of the Park-side Mental Hospital; F. Anstead Browne, county architect, The Castle, Chester.

Motherwell.—Houses (276), for Town Council (£125,000); burgh surveyor.

New Barnet.—Factory and offices, Cromer Road, for S. Maw, Sons & Co., Ltd.; E. R. Taylor, architect, 5, Manchester Square, London, W.1.

New Windsor.—Houses (86), Clewer Manor Estate, Dedworth, and houses (28), St. Leonards Road, Spital, for T.C.; F. N. McRae, borough engineer, 16, Alma Road, Windsor.

Newcastle-on-Tyne.—Shops and offices in New Bridge Street and Princess Street for the Pilgrim Investment Trust; C. S. Errington, architect, 46, Grainger Street, Newcastle.

Newcastle-under-Lyme.—Houses (121), Milehouse estate (£47,850); borough engineer.

Northallerton.—New housing estate at Sandly Bank; U.D.C. surveyor.

Northumberland. — Nurses' home at Wooley Sanatorium; extensions to Monkseaton Senior School and infant welfare centre at Monkseaton, for the C.C.; county architect, County Hall, Newcastle-on-Tyne.

Orpington.—Cinema, Petts Wood Road; D. E. Nye, architect, Pereira House, Tufton Street, London, W.1.

Oxford.—Houses (22), Inott Furze and Fairview Estate; A. C. Carter. Rebuilding premises, 18-21, Cornmarket Street; W. A. Lewis & Partners.

Port Talbot.—Houses (36), Miners Row and Colliers Row, Cwmavon, for T.C.; W. King Davies, town clerk, Municipal Buildings.

Scarborough.—Houses (18), Edge Dell, for Mr. Webster; F. Baker, architect, York Place. Hotel; Kitching & Co., architects, 21, Albert Road, Middlesbrough. Houses (18), Evelyn Drive, for F. W. Plaxton; Jones & Rickaby, architects, 102, Westborough. Houses, Osborne Park estate; J. Petch & Son, architects, Valley Bridge Parade, Scarborough. Holiday camp near Cayton Bay (£180,000); A. J. Thraves, architect, Whitefriars House, Friar Lane, Nottingham. Health centre (£19,000), Manor Road Gardens, for T.C.; borough surveyor.

School Aycliffe (Co. Durham).—Staff cottages at Durham County Council Mental Colony (£10,779); Kettlewell, Son & Co., Hull.

Seaham.—Houses (150); U.D.C. surveyor.

Seaton (Co. Durham).—Factory for Head, Wrightson & Co., Ltd., bridge builders, Stockton-on-Tees; direct labour.

Sedgefield.—Conversion of dance hall into cinema for R. W. Snauth; J. H. Simpson, architect, New South View, Ferryhill.

Sheffield.—Houses (16), Den Bank Crescent; A. Spooner, 520, Manchester Road, Sheffield, 10. Houses (26), Ferrars Road and Norborough Road; D. Topliss, builder, 19, Gisborne Road. Flats (65) and shops, Edward Street, for the Estates Committee (£47,945); city architect, Public Works Department. Houses (192), Parsons Cross estate, for the Estates Committee (£70,596); Insley & Son, Ltd., contractors, Gresley Lane, Grenoside.

South Shields (Co. Durham).—Houses (215); J. Reid, borough engineer, Town Hall. Mortuary; J. Reid, borough engineer. Community centre at Marsden Road, including branch library, assembly hall, clinics, relief station, &c. (£23,440); borough engineer. Gymnasium, Stanhope Road School, for the E.C.; H. Hill, architect, 10, Winchester Street. School, Highfield estate; R.C. authorities.

Southall.—Municipal buildings, site in South Road, for B.C.; Selby & Sanders, quantity surveyors, Caxton House, Westminster, S.W.1.

Stanley (Co. Durham).—Offices (£10,000); U.D.C. surveyor. Swimming baths (£20,000); J. Routledge, surveyor, Council Offices.

Stirlingshire.—Secondary school, Kilsyth, for E.C.; county architect, Stirling.

Stockport.—Junior school, Broadstone Hall Road; Cruickshank & Seward, architects, 16, Princess Street, Manchester.

Stourbridge.—Houses (50), Rufford estate, for T.C.; G. Ince, Town Clerk.

Stourport-on-Severn. — Houses (100), Walshes Farm estate, for U.D.C.; Pritchard, Godwin & Clist, architects, Bank Buildings, Kidderminster.

Stretford.—Library and underground shelter (£16,000), for T.C.; borough surveyor. Works extensions, Galgate Street; Ubique Welding Co. Bakery, Brixham Road; J. Oldfield.

Sunderland.—Houses (48), at Ryhope; R.D.C. surveyor, Esplanade.

Surbiton.—Development of 208-acre estate, Kingston By-pass, for garden city; H. Elliott, builder, Hook.

Wakefield.—Flats (27), Warrengate, and houses (70), Portobello; city architect.

Wallsend.—Houses (8); D. Gateshill, builder, Croft Road, Blyth. Cinema, for R. W. T. Lubbock; Arthur & Kirkup, architects, 13, Swinburne Street, Gateshead. Houses (24), Boyd Road, for John Moody; Wilson & Wilson, architects, St. Nicholas' Buildings, Newcastle-on-Tyne.

Walsall. — Additional accommodation for 400 children at Goldsmith Road Council School; M. R. Habershon, borough surveyor, the Council House.

Ware.—Reconstruction of Ware Park Sanatorium (£90,000); Paine & Hobday, architects, 2, Millbank House, London, S.W.1.

Watford.—Modern school (£50,125); Herts Education Committee.

Wellington (Salop). — Houses (108), Mannerley Lane and Rock site, Ketley, for R.D.C.; James Hickman & Son, architects.

Welwyn Garden City.—Houses (274) (£113,332); U.D.C. surveyor.

West Hartlepool (Co. Durham).—Shops (12), on Council estate; F. Durkin, borough engineer.

West Lothian.—Reorganisation at Tippethill Hospital, and conversion of Bo'ness Infectious Diseases Hospital into General Hospital (£15,000); county architect, Linlithgow.

Weston-super-Mare.—Hotel (£150,000), Beach Road; H. G. Pedrick, Weston.

Weymouth.—Hospital for Weymouth and Portland Joint Isolation Hospital Board; Paine & Hobday, architects, 2, Millbank House, Wood Street, London, S.W.1.

Willington.—Police station for Northumberland County Council; W. W. Tasker, county architect, County Hall, Newcastle-on-Tyne.

Worcester.—Two-storey cubicle block and operating theatre, Isolation Hospital, for T.C.; city surveyor. Houses (28), Martley Road site, for T.C.; city surveyor.

Workington.—Development of 18 acres of land at Westfield Farm for housing estate.